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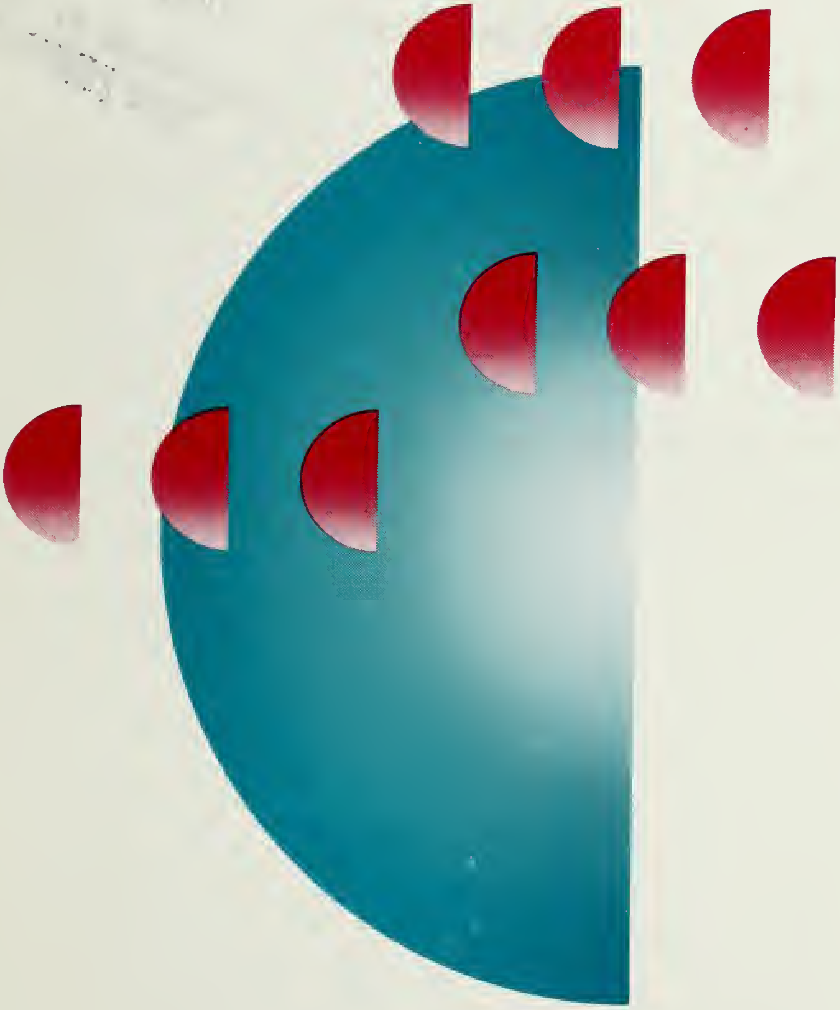
Commuting Patterns of Route 128 West Area Employees & Alternatives to Reduce Congestion



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Commuting Patterns of Route 128 West Area Employees & Alternatives to Reduce Congestion

Author
Annette L. Demchur

Contributing Analyst
V. J. Mahal

Graphics
Jane Gillis
Carol Gautreau Wilson

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Abstract

This study analyzes an employee survey conducted by the 128 West Transportation Council, and uses the findings of the survey to develop alternative strategies for reducing traffic congestion in the 128 West area. The survey was used to determine commuting characteristics and preferences of employees of 128 West area companies. This information was used to develop and evaluate potential commute alternatives.

Copies may be obtained from the State Transportation Library, Ten Park Plaza, 2nd floor, Boston, Massachusetts 02116

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Executive Summary

The 128 West Transportation Council was organized to establish a cooperative forum of developers and employers for addressing transportation-related problems. To search for innovative strategies to reduce congestion was a primary purpose. As an initial step in identifying relevant issues, the Transportation Council conducted an employee survey during the summer of 1988. The survey was distributed to employees of 71 companies in Waltham and two in Lexington, all located near Route 128 between Route 20 and Route 2. This report provides analyses of the survey responses and recommendations for reducing congestion in this area.

The survey responses show that commuters to the 128 West area are spread out among many communities in Massachusetts, New Hampshire, Rhode Island, and Maine. Those with the highest proportions of the commuters are Waltham, with 8.2 percent of the survey respondents, and Boston, with 6 percent. All other communities are represented by 3.2 percent or less of the survey respondents. By far the most common mode of transportation to work is the private automobile, and most commuters drive alone. Only six percent of the 128 West commuters carpool or vanpool.

Twenty-seven percent of the respondents arrive (depart) during the peak half hour of each peak period (7:46 AM - 8:15 AM and 4:46 PM - 5:15 PM), but the PM peak is more spread out than the AM peak: 48 percent of the respondents arrive at work during the AM peak hour (7:46 - 8:45 AM), while 39 percent depart during the PM peak hour (4:16 - 5:15 PM). A higher proportion of employees arriving at work during the AM peak hour drive alone than of those arriving at any other time of the day.

The concentration of arrivals and departures during the peak hours is in part due to a lack of flexibility in employee work schedules. Fifty-five percent of the respondents have no flexibility in setting their work schedules, and another 20 percent require company approval of their schedules. This lack of flexibility is even greater for commuters who arrive and depart during the peak hours. Sixty-five percent of the respondents traveling during the peak hours have no flexibility in setting their work schedules.

These findings suggest the opportunity for two general approaches to reducing traffic congestion:

- Encourage flextime, a form of demand management, to spread out peak traffic volumes

- Increase the availability and encourage the use of alternative high-occupancy transport options through supply management and incentives

While both supply- and demand-management strategies have proven effective in reducing congestion, there is some risk in trying to implement them simultaneously, because demand-management actions which spread out commuter demand may diminish the critical mass required for effective ridesharing or transit services. However, if well-orchestrated and appropriately marketed, these strategies can be used together in the 128 West area to meet varied commuter needs.

The major focus of the study was on the identification of innovative supply-management strategies for increasing vehicle occupancies. The primary commute alternatives explored were remote park-and-ride and shuttle buses from public transportation stations or stops. Employee commuting patterns were analyzed to determine potential targets for the commute alternatives. These analyses focused on zones comprising contiguous towns along the major transportation corridors that represent spokes from Route 128. The hometowns of commuters who spend more than one-half hour to get to work were identified, since these are the employees who would most likely consider the commute alternatives. The travel time data indicate that the primary potential sites for remote park-and-ride lots, where commuters can meet to carpool or vanpool, are areas near the intersections of Route 495 with Routes 3, 2, 20, 93, and 95 and the Massachusetts Turnpike.

One of the problems associated with ridesharing--for some employees--that is not addressed by flextime or the provision of park-and-ride lots is variability of the work schedule from day to day. While some carpools and vanpools allow members to participate on a parttime or one-way basis, most ridesharing arrangements are inconvenient for people with unpredictable or varying work hours. Shuttle services allow greater variability in employees' schedules. In order for a shuttle operation to work efficiently, a relatively dense population of commuters must be present. Potential collector locations for shuttles include rail and rapid transit stations, new park-and ride lots, and underutilized private parking lots.

In general, commute alternatives will attract a limited number of 128 West commuters from the drive-alone mode, given current conditions. None of the alternatives identified offer travel time savings over the drive-alone mode, and little if any cost savings are offered. At most, the alternatives are likely to attract commuters who are looking to reduce the amount of driving required to get to and from work and those who are very concerned about cost.

The remote park-and-ride lot staging area option is the most likely to draw existing drive-alone commuters, because it represents little added commute time, offers the most significant cost savings of the alternatives, and has the largest commuter-shed. It also would be easy to implement, for the following reasons:

- Existing, underutilized lots would be used at low or no cost.

- Initial implementation can be limited to carpooling and vanpooling staging areas, and employers can work with the Transportation Council and CARAVAN (free of charge) to establish rideshare matches.

- If demand is high enough, shuttle service could later be implemented. The initial operation of carpools and vanpools would provide the required data about potential demand for shuttle services.

Considering that relatively few commuters would be expected to use any of the commute alternatives unless conditions change, the low cost of remote park-and-ride lots is an important advantage. This approach is the most conservative and, therefore, perhaps the most appropriate, given existing conditions encouraging the single-occupant-vehicle commute mode. These lots could also be used by commuters with other destinations in the metropolitan area, and therefore could encompass a much larger market than that defined by the 128 West Transportation Council.

1 Introduction

During the last two decades, American cities have witnessed a movement of employers from downtown to suburban locations in response to the need for more space, the increased cost of downtown office space, increased downtown traffic congestion, and the desire to locate closer to the work force. Because the movement of employers to suburban locations has shifted metropolitan area employment from one central location to many disperse, less dense locations, commuter travel patterns have changed. Both employee hometowns and employer locations have spread across much larger areas, causing changes in traffic patterns from the more traditional, radial suburb-to-downtown commute to many different suburb-to-suburb commutes.

The shift to suburban employment centers has led to greater dependence on the private automobile. Traditional transit services were not set up to serve suburb-to-suburb trips, and most commuters do not have an alternative to the private automobile. Additionally, suburban employment locations have ample free parking, making the private automobile one of the most inexpensive and attractive means of transportation to work. Consequently, the single-occupant vehicle has become the predominant mode choice of suburban commuters. As suburban employment centers have expanded, traffic congestion in and around these centers has become an increased concern. In response to this concern, many suburban employers and municipalities are searching for ways to reduce congestion.

Suburban mobility has been identified as one of the most pressing transportation problems for today's urbanized areas. Transit services are generally geared to serve trips to and from downtown, and little, if any, service is provided between suburban locations. Suburban employment centers are generally low-density developments spread over large areas, and the reduced density of commuters on both the home and work ends of the suburb-to-suburb commute makes it difficult to provide efficient transit service for these trips.

Because it is difficult to implement transit in these areas, employers and municipalities are searching for more innovative approaches to reducing the number of drive-alone commuters. To this end, many either have established an in-house rideshare resource or have joined together with neighboring companies to establish transportation management organizations (TMO's). These organizations focus on the identification of strategies for reducing traffic congestion. While one aspect of this effort is to lobby for roadway improvements, these organizations also look for innovative strategies for increasing vehicle occupancy.

The purpose of this report is to examine strategies for reducing congestion in the area of Waltham around Route 128. The 128 West Transportation Council (formerly the Waltham 128 Transportation Council) was formed in the spring of 1987 in response to increasing concerns about traffic congestion in this area. The Council, which is a TMO, was organized to establish a cooperative forum of developers and employers to address transportation-related problems and to search for innovative strategies to reduce congestion.

The analysis presented here draws upon an employee survey conducted by the Council to examine existing commuter behavior and determine commute alternatives that can be implemented to reduce congestion. This report summarizes the survey responses and uses information drawn from these responses to identify strategies for reducing congestion. Chapter 2 describes the study area. Chapter 3 summarizes the results of the employee survey and identifies their major implications. Chapter 4 discusses alternative forms of transportation for commuters to and from the study area and evaluates the most promising alternatives. Chapter 5 offers conclusions and discusses implementation of alternatives.

2 The Study Area

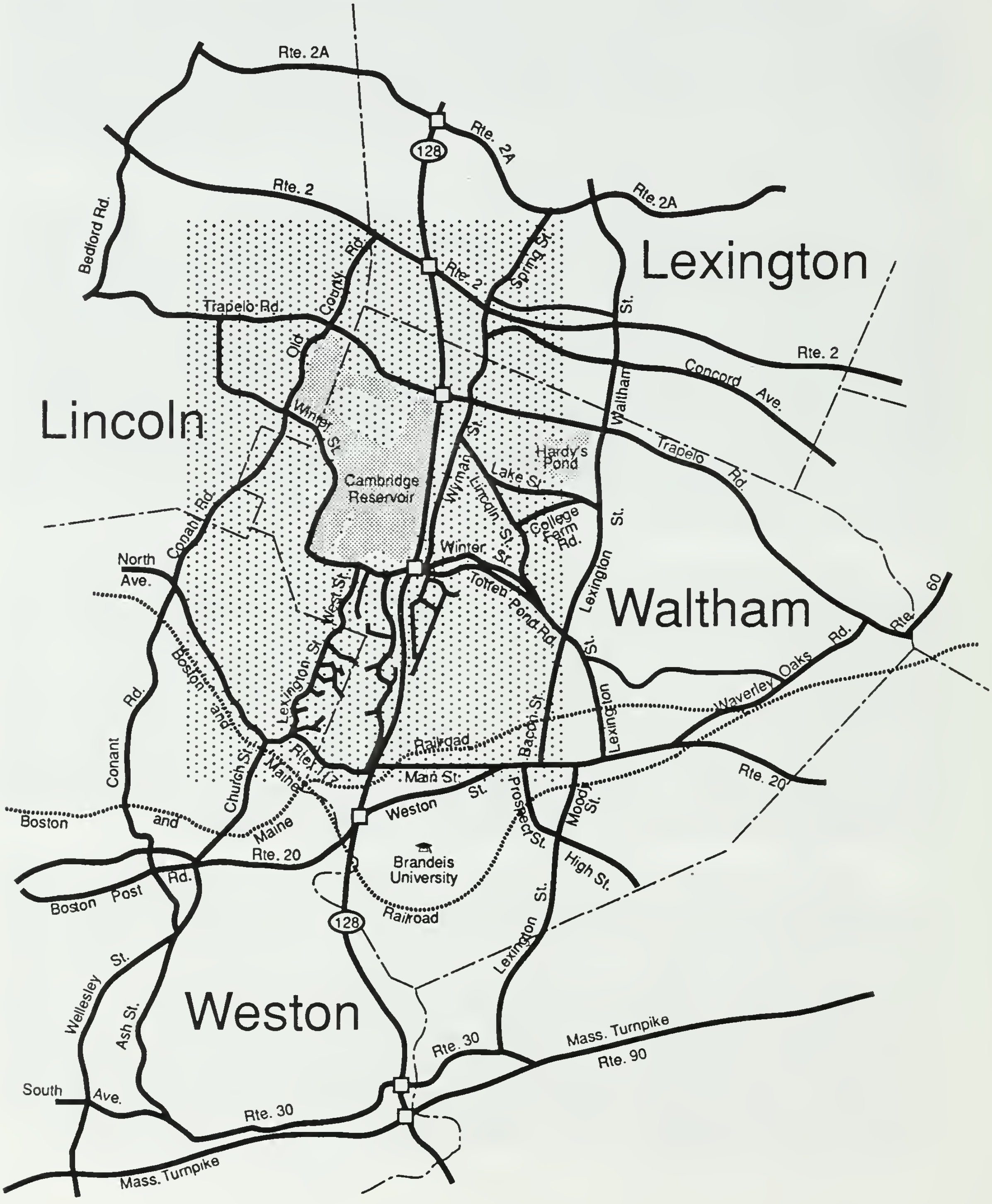
In Massachusetts, the concentration of companies in suburban locations along Route 128 has led to increased congestion on 128 and its feeder roadways. One of the most densely developed areas of this corridor is the area in and around Waltham. The study area, as defined by the 128 West Transportation Council, includes the area around Route 128 with the highest density of employment and extends from Route 20 in Waltham to just above Route 2 in Lexington (see Figure 2-1).

As with most suburban employment center locations, transit service is extremely limited between other suburban towns and the 128 West area as well as within this area. Most suburban transit service in the Boston metropolitan area, both public and private, is focused on providing service to downtown Boston. The six MBTA bus routes serving Waltham provide feeder service to commuter rail or rapid transit stations, or express buses to downtown or direct express bus service to downtown. The only route (Route 61) which provided inter-suburban and crosstown service between the 128 West area and Lexington was eliminated on December 30, 1989. No private bus service is provided from suburban towns to or around the 128 West area.

Four commuter rail lines have stations located near Route 128: the Fitchburg-Gardner Line (Waltham Center and Kendall Green), the Framingham Line (Auburndale and West Newton), The Attleboro/Stoughton Line (Route 128), and The Haverhill/Reading Line (Reading). No service is provided between the commuter rail stations and the 128 West employment center. Two rapid transit lines have termini near the 128 West area: the Red Line Alewife Station and the Green Line Riverside Station. No publicly operated transit service is provided between the rapid transit stations and the 128 West employment center.

The Transportation Council has already taken a step toward improving accessibility to 128 West employment locations. In recognition of the need to link the 128 West area with the existing public transportation system, the Transportation Council established a shuttle service between the Alewife (Red Line) MBTA station and the 128 West area (with six stops at 128 West employment locations). The shuttle operates with 45 minute headways in the AM peak (7:00 AM to 9:00 AM) and every hour in the PM peak (4:00 PM to 6:00 PM). However, as indicated by the disperse locations of employees homes, this shuttle only serves a small portion of the 128 West commuters.

Figure 2-1
Route 128 West Study Area



In addition to a lack of transit service, parking in the 128 West area is abundant and free. Therefore, in spite of congested roadways, there are few disincentives to driving, and most commuters (92 percent of the 128 West survey respondents) drive alone to work. While it is prohibitively expensive to implement traditional transit service in these areas due to low-density development and dispersed travel needs, some more innovative approaches to transportation management may result in traffic reductions. Thus, efforts to relieve traffic congestion in the 128 West area are focused on traffic reduction alternatives.

3 The 128 West Employee Survey

The 128 West Transportation Council conducted a survey of employees of companies located in the 128 West area to determine existing commuting behaviors and commuting preferences. The survey and its results are described in detail in this chapter. Appendix A of this report is a copy of the questionnaire.

More specifically, the survey was designed to determine the following:

- Where employees of firms in this area live (and consequently, the towns which they commute from)
- The times employees arrive and depart work
- The degree of flexibility the employees have in their work schedules
- Which mode of transport employees usually use to get to work and how frequently they use alternative modes
- The amount of time it takes employees to get to work and the amount of variability in travel time from day to day
- What route the employees use to get to work
- How frequently the employees use their cars during work hours or for stops on the way home from work and for what purposes
- Which locations would be convenient for transportation centers
- How many autos are in the employees' households
- How frequently the employees travel from their offices to Logan Airport
- What types of positions the employees hold

The survey included a map of the roadways leading to and around the study area for respondents to trace their routes to work. Additionally, surveys were coded to identify the company where each employee works.

3.1 Survey Distribution

The survey was conducted during the summer of 1988 and included 71 companies in Waltham and two in Lexington. The total employment of these companies was more than 15,000, representing approximately 50 percent of the work force in the study area. The Council provided a representative of each company with survey cards, and asked the representatives to distribute the surveys to all employees of their respective companies.

Companies were selected by the Council to include a variety of business types and sizes (see Appendix B). Company size ranged from two to 5,000 employees, with an average size of 208 employees. Sixteen of the companies surveyed were members of the 128 West Transportation Council, and member companies employed 77 percent (11,640) of the employees surveyed. Of the 5,036 surveys returned, 4,953 were useable. Thus, the return rate was 34.5 percent, which represents 17 percent of the study area total employment. The return rate was slightly higher for member companies (35.4 percent) than for non-members (30.1 percent). Twenty-nine of the companies were not represented by the survey responses (i.e., none of the surveys distributed to employees of these companies were returned), and four of these companies were Council members.

3.2 Survey Findings

The findings of the survey can be grouped into three categories, each of which can be used to identify commute alternatives for 128 West area commuters:

- Those which describe the characteristics of the survey respondents
- Those which describe the commuting behavior of the survey respondents
- Those which provide insight to the potential use of commute alternatives

The survey shows that most commuters to the 128 West employment center live in suburban towns and drive alone to work. The hometown locations of survey respondents are spread out across eastern Massachusetts and southern New Hampshire, and some survey respondents even commute from Rhode Island and Maine. The summary presented below provides detailed information about the survey respondents.

3.2.1 Characteristics of Survey Respondents

Question

What is your position?

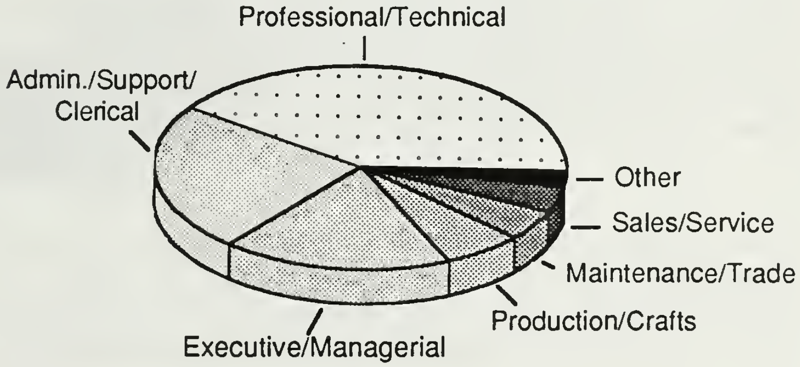
Summary of Responses

The majority of the survey respondents were professional/technical employees (40 percent), administrative/support/clerical (23 percent), and executive/managerial (18 percent). Figure 3-1 shows the breakdown of survey respondents by employee type.

Discussion

The survey sampling attained a mix of respondents across employee types. While precise data about the number of employees in each category employed in the study area is not available, the mix obtained by the sample appears to provide reasonable representation from each category.

Figure 3-1
Survey Respondents by Employee Type



Question

How many automobiles are owned by you and members of your household?

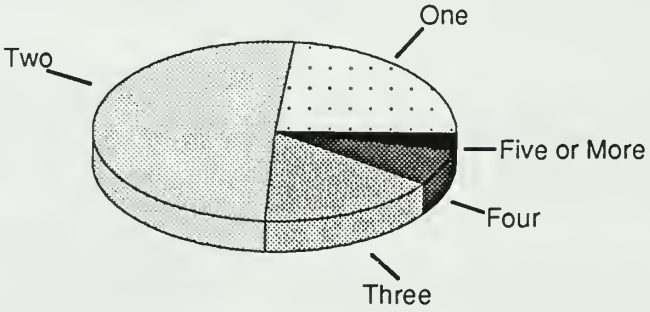
Summary of Responses

Automobile ownership of survey respondents was high. All survey respondents had at least one automobile in their households, and 77 percent had more than one (see Figure 3-2).

Discussion

The automobile ownership characteristics of the survey respondents are not unlike those of most suburban residents. Because distances between activities are greater than in urban locations and public transit is not as available, suburban residents are much more dependent on their automobiles. Additionally, two-worker households are on the increase, and they tend to own more cars than one-worker households, because of commuting requirements. Finally, because transit options for commuting to and from the 128 West area are limited, potential employees who do not drive or have access to an automobile are not likely to seek employment in this area.

Figure 3-2
Auto Ownership



Question

Where do you live?

Summary of Responses

Commuters to the 128 West area are spread out across 240 different cities and towns in Massachusetts, New Hampshire, Rhode Island, and Maine. As shown in Figure 3-3, most of the survey respondents live in Massachusetts (95 percent), three percent of the employees commute from New Hampshire, and the remaining two percent commute from Rhode Island and Maine.

Towns with the most significant number of commuters include Waltham, with 8.2 percent of the survey respondents, and Boston, with six percent of the survey respondents. All other towns represent 3.2 percent or less of the survey respondents, the most significant of which are Newton, Arlington and Billerica.

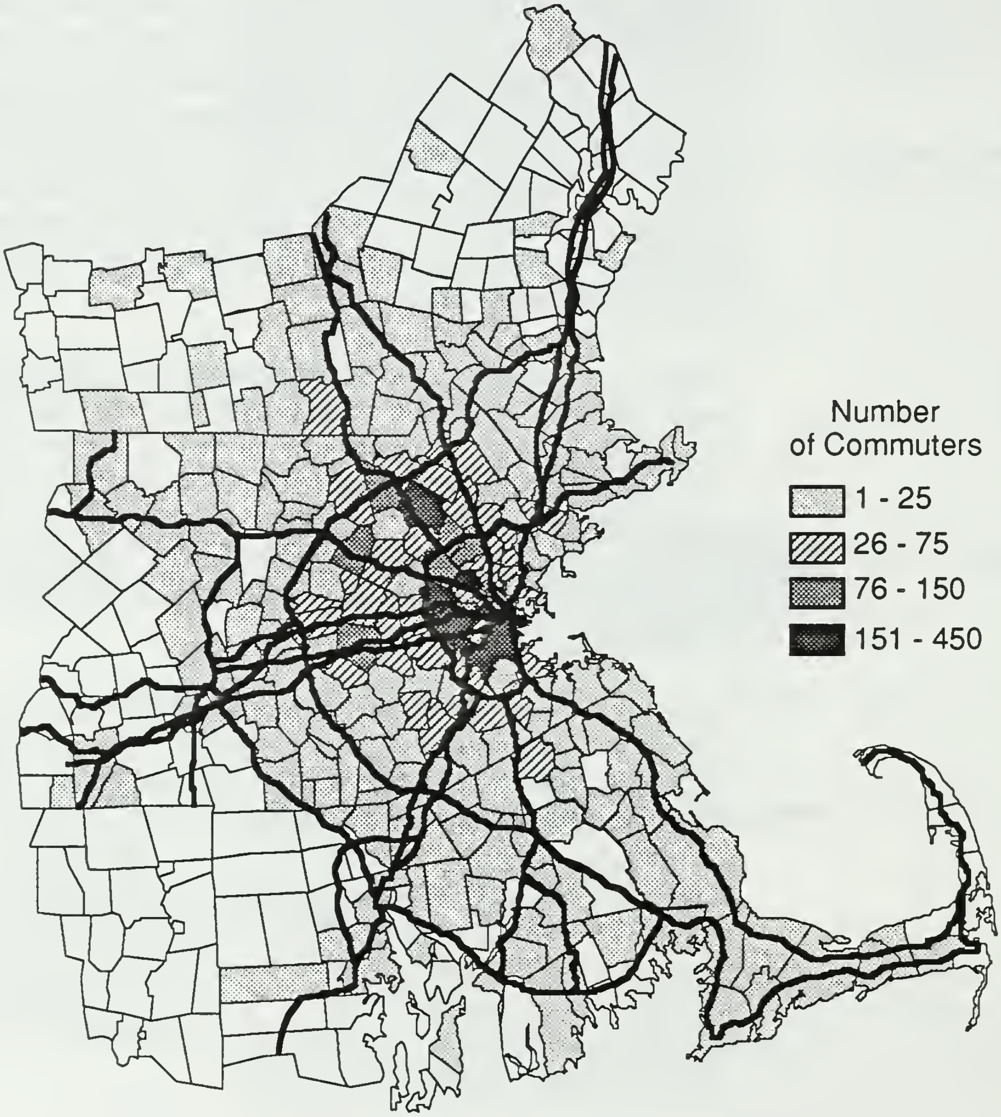
Discussion

The broad distribution of commuters across eastern Massachusetts and bordering states makes it difficult to implement traditional transit service to reduce congestion, which relies on high concentrations of potential riders between the origin and destination of the route. Thus, transit options in this area are limited to services between the 128 West area and the densest hometowns (Waltham, Boston, Newton, Arlington, and Billerica) or collector points, such as commuter rail and rapid transit stations. More innovative approaches to increasing vehicle occupancy must be examined for the remaining commuters.

While the density of commuters is too low in most towns to provide traditional transit service, efforts could be undertaken to provide staging areas where commuters could meet to form shared-ride or transit arrangements. By locating these staging areas close to commuter hometowns or along their routes to work, minimal time would be added to the drive-alone mode choice trip.

There is a concentration of employee hometowns along the major highways feeding Route 128. Generally, carpooling and vanpooling have proven to be the most effective strategies for increasing vehicle occupancies in suburb-to-suburb commuting. Therefore, the concentration of employee hometowns along major highways indicates that there is a potential for shared-ride alternatives, and more innovative approaches to increasing vehicle occupancy (such as staging areas) could be effective in reducing congestion in these corridors (as discussed in Chapter 4).

Figure 3-3
Hometowns of Survey Respondents

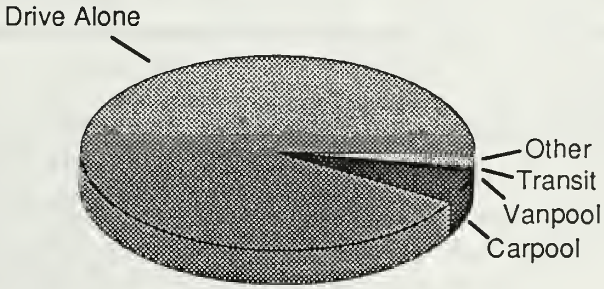


3.2.2 Commuting Patterns of Survey Respondents

Question **How do you most frequently get to work?**

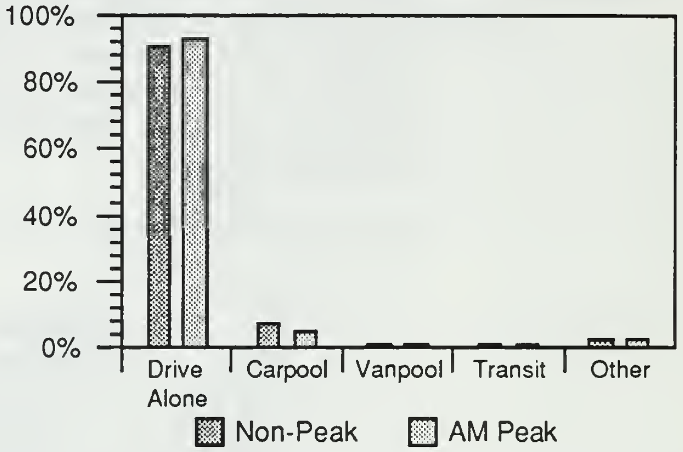
Summary of Responses By far the, most common mode of transportation to work is the private automobile, and most commuters drive alone. As shown in Figure 3-4, most 128 West commuters (92 percent) drive alone to work, only six percent of the commuters carpool or vanpool, and very few (0.3 percent) commuters use any form of public transportation.

Figure 3-4
Mode Choice



More employees arriving at work during the AM peak hour drive alone than at any other time of the day. Figure 3-5 compares the AM peak commuter mode choices with those travelling during the off-peak.

Figure 3-5
Non-Peak and Peak Commuter Mode Choices



Discussion

Part of the popularity of the drive-alone mode to work is attributable to the lack of convenient alternatives. The area is not served by public transit, and the only private transit service to the area is an Alewife MBTA station shuttle service sponsored by the 128 West Transportation Council. The Alewife shuttle makes a limited number of stops, and, as a result, does not serve all destinations in the 128 West area. Therefore, a limited number of potential trips are served by the shuttle.

Some efforts have been made to encourage carpooling in the 128 West area. These efforts have been expanded by the 128 West Transportation Council to tap the greater pool of potential carpool participants by looking across companies. To this end, the Council is working with the CARAVAN Ridesource program to match carpool participants..

Question

If you are carpooling or vanpooling, how many passengers are in the vehicle (not including driver)?

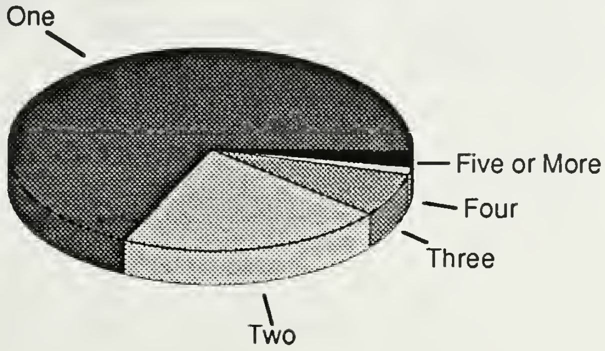
Summary of Responses

The average number of persons in carpools and vanpools to the 128 West area is just over two (including the driver). Sixty-eight percent of the commuters who use carpools or vanpools to commute to the 128 West area only have one passenger. Of the remaining 33 percent, 21 percent are in two passenger vehicles, seven percent include three passengers, one percent have four passengers, and three percent have more than four passengers (see Figure 3-6).

Discussion

Most shared-ride transport to the 128 West area involves two individuals; shared ride arrangements between more than two people are rare. This is not atypical of carpools in general, because most carpool arrangements involve increased travel time for the driver, and the travel time increases with each additional passenger. Additionally, it becomes increasingly difficult to coordinate schedules as the number of participants increases. The barriers to increasing the number of carpool participants could be reduced by increasing the availability of information about potential carpool participants and providing convenient staging areas for carpool participants which minimize the added travel time attributable to shared-ride arrangements.

Figure 3-6
Number of Passengers in Carpool/Vanpool (Not Including Driver)



Question

If you ever use other modes of transportation to get to work, which are you most likely to use?

Summary of Responses

As shown in Figure 3-7, 66 percent of the survey respondents said that they do not use an alternative commute mode. The single most popular alternative of commuters who use alternative modes was "dropped off" (29 percent), but the combination of commuters who selected carpool driver and carpool passenger is higher (36 percent). The proportion of commuters who usually walk, take a bus, or drive alone to work using alternative modes is much lower than those who usually use the other modes.

The most common alternative modes for commuters who usually drive alone were some form of carpool (driver or passenger) and dropped off. The most common alternative mode for commuters who do not usually drive alone was the drive-alone mode.

Figure 3-7a
Alternative Commute Mode of Non-Drive-Alone Commuters

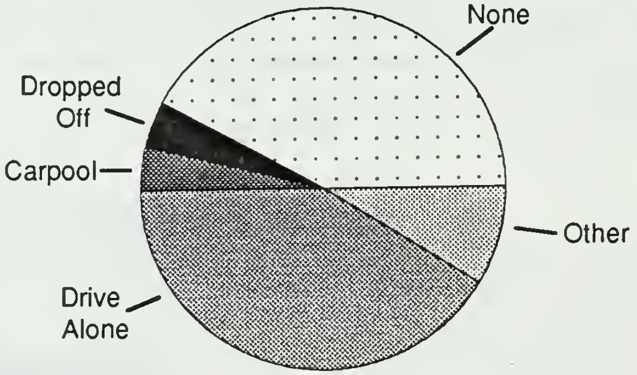
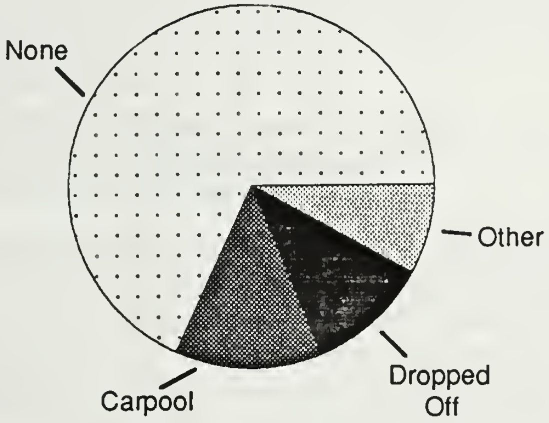


Figure 3-7b
Alternative Commute Mode of Drive-Alone Commuters



Discussion

The most popular alternative mode of transportation to work for the survey respondents was "dropped off." In the cases where the driver combines this trip with an existing trip (e.g., a work trip), this a form of ridesharing but in the cases where the "drop off" is the purpose of the trip, it is similar to the drive-alone mode. The second two most popular forms of alternative transportation are "carpool driver" and "carpool passenger." These choices show that the second most desirable form of transport to work (if a person's car is unavailable for the work trip) is some form of ridesharing. This is a reflection of both the convenience of being dropped off directly at the work site and the absence of alternatives to the private automobile. This also shows that most commuters would choose a ridesharing mode if the drive-alone option was not available for the work trip.

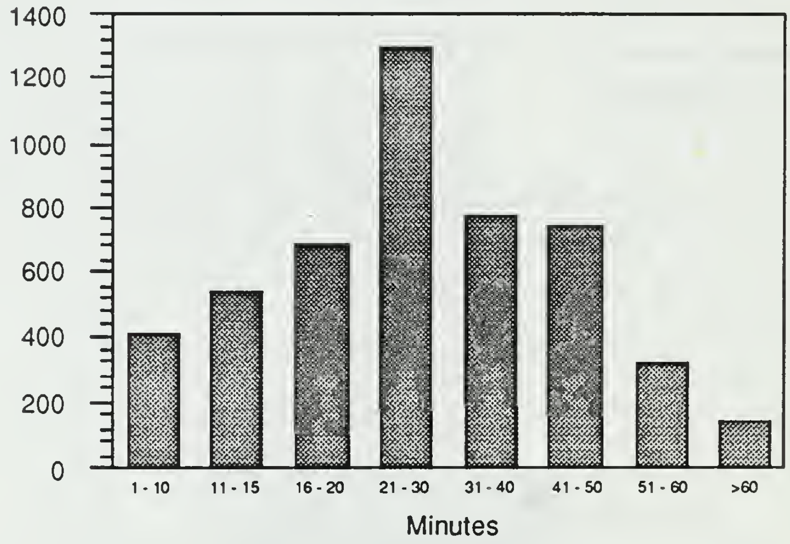
Question

How long does it usually take you to commute to work?

Summary of Responses

The average commute time for all survey respondents is 31 minutes. Ninety-one percent of the survey respondents spend 50 minutes or less commuting to work, and 60 percent spend 30 minutes or less. Figure 3-8 shows the commuting times of survey respondents. Most of the respondents (26 percent) spend between 21 and 30 minutes commuting to work, and 82 percent spend between 11 and 50 minutes. Less than 10 percent spend more than 50 minutes commuting to work, and 8.3 percent spend 10 minutes or less.

Figure 3-8
Commute Times



Discussion

Commute times of 128 West commuters are not excessively long when compared with commute times of downtown Boston employees. Even though suburban roadways have become congested, conditions are not bad enough to force drivers out of their single-occupant automobiles. Additionally, many of the commuters with the longest travel times commute great distances to get to work, most of which are not congested for the entire length of the trip.

The location of rideshare staging areas should be easily accessible for the concentrations of commuters who are travelling more than one-half hour to get to work, mostly on congested roadways. These locations will not be in the hometowns of those who are travelling the longest distances (and spending the most time commuting), but could be located along the routes they currently use to travel to work to reduce the length of the drive-alone trip.

Questions

What time do you usually arrive at work?
What time do you usually leave work?

Summary of Responses

The survey analyses show that 27 percent of the respondents arrive (depart) during the peak half hour of each peak period (7:46 AM to 8:15 AM and 4:46 PM to 5:15 PM). However, the PM peak is more spread out than the AM peak: 48 percent of the respondents arrive at work during the AM peak hour (7:46 to 8:45 AM), while 39 percent depart during the PM peak hour (4:16 PM to 5:15 PM). Additionally, 78 percent arrive at work during the AM peak period (6:46 AM to 8:45 AM), while only 63 percent depart during the PM peak period (3:46 PM to 5:45 PM). Figure 3-9 shows the arrival and departure patterns of 128 West commuters.

Figure 3-9a
Arrival Times

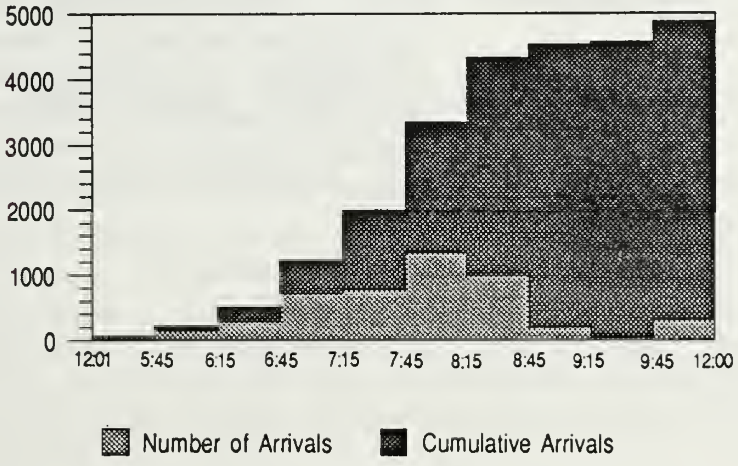
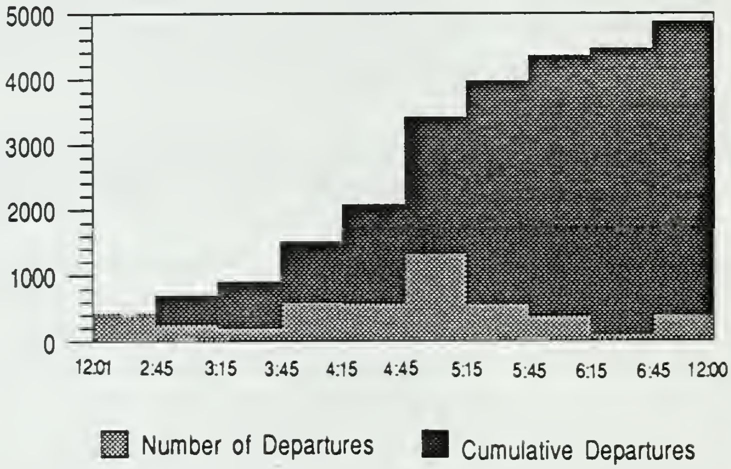


Figure 3-9b
Departure Times



Discussion

While employee arrivals and departures in the 128 West area are slightly less peaked than those of downtown Boston, the opportunity exists for spreading peak volumes further. Many of the area's employees do not have the flex time option, and most of these employees have to arrive and depart work during the peak. However, caution must be taken in encouraging flex time concomitant with shared ride promotions, as efforts to spread out demand could reduce the opportunities for finding suitable ride matches. Because traffic volumes in the 128 West area are high throughout the day and because peak period volumes are already somewhat spread, the better strategy for reducing congestion in this area would be to reduce the number of vehicles travelling on the roadways in the area by increasing vehicle occupancies.

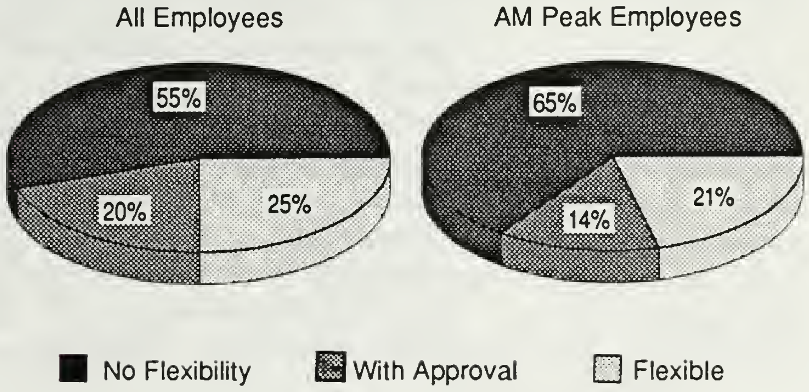
Questions

How is your work schedule set?
How much flexibility do you have in choosing the time you start work on a day-to-day basis?

Summary of Responses

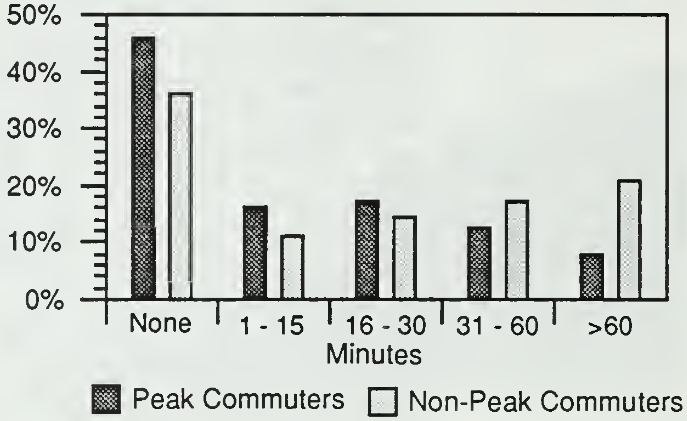
The concentration of arrivals and departures during the peak hours is in part due to a lack of flexibility in some employee work schedules. Fifty-five percent of the employees responded that they have no flexibility in setting their work schedules, and another 20 percent of the employees require company approval of their schedules. This lack of flexibility is even greater for commuters who arrive and depart work during the peak hours. Sixty-five percent of the employees traveling during the peak hours do not have any flexibility in setting their work schedules. Figure 3-10 compares the amount of work schedule flexibility for all employees with those who commute during the peaks.

Figure 3-10
Work Schedule Flexibility



Forty-one percent of the survey respondents said that they have no flexibility in the time they start work on a daily basis. As shown in Figure 3-11, a greater proportion of the employees who arrive or depart work during the peak hours have no flexibility in the time they arrive at work daily than those who travel in the off-peaks.

Figure 3-11
Arrival Time Flexibility



Discussion

Table 3-1 summarizes the work schedule and start time flexibility for all survey respondents and those who commute during the peaks. As shown, many of the people driving during the peak hours (64 percent) do not have the flexibility to change their schedules to avoid peak congestion. This indicates that many of the companies which do not have flex time policies set work hours which require their employees to commute during the peak periods. These companies would be primary candidates for rideshare promotion since this rigidity could be used as a positive factor in establishing shared-ride arrangements by matching employees according to complementary schedules. Alternatively, the implementation of flex time by these companies could reduce peak congestion.

Table 3-1
Work Schedule Flexibility of Drive-Alone Commuters

	All Day	AM Peak	PM Peak
Flexibility in Work Schedule:			
None	55.3%	64.2%	63.5%
With Company Approval	20.1%	14.2%	15.9%
Without Approval	24.4%	21.5%	20.4%
Flexibility in Work Hours:			
None	40.8%	45.6%	44.6%
Up to 15 Minutes	13.5%	16.1%	16.0%
16 - 30 Minutes	15.8%	17.2%	15.8%
31 - 60 Minutes	14.8%	12.5%	14.1%
Up to 2 Hours	8.1%	5.1%	5.9%
More than 2 Hours	6.8%	3.1%	3.3%

Questions

Does the time it takes you to commute to work vary from day to day?
If your commute to work varies, by how much does it usually vary?

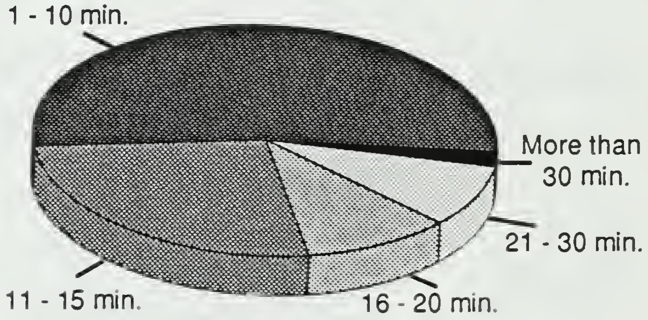
Summary of Responses

The greatest proportion of survey respondents (47 percent) said that their commute time varies occasionally, 32 percent said it was hardly varied at all, and 21 percent said that it varied frequently. Most respondents (52 percent) said that their commute times only varied by 1 to 10 minutes, and 78 percent said that their commute times vary from 1 to 15 minutes (see Figure 3-12). Note that this figure does not include respondents whose commute time does not vary.

Discussion

Commute times vary little for more than one half of the survey respondents. However, 21 percent of the survey respondents said that their commute times vary frequently. Additionally, 22 percent of the survey respondents with variable commute times said that their commute time varies more than 15 minutes. Therefore, while most respondents do not have significant problems with commute time variability, there are a number who do. This variability can be attributed to congestion, incidents on the roadways and the interrelationship between the two. Thus, reductions in congestion may reduce commute time variability.

Figure 3-12
Commute-Time Variability



Question

If you usually use Route 128 for your commute to work, which portion do you use?

Summary of Responses

Sixty-five percent of the survey respondents use Route 128 to commute to work. The most significant entrance used by survey respondents is at Route 3 (the Middlesex Turnpike and Lowell Street); 14.5 percent of the respondents who identified where they enter Route 128 said they entered here. Table 3-2 summarizes the most commonly used entrances to Route 128.

Most (62 percent) of the survey respondents who identified where they exit Route 128 said that they use Winter Street. Other exits used include Trapelo Road (12 percent), Route 2 (12 percent), and Route 20/Weston Street (10 percent). Figure 3-13 shows the distribution of survey respondents among these exits. Route 2A is used by 4 percent of the survey respondents, and all other exits get minimal use.

As expected, the most commonly used entrances to Route 128 are those fed by the major arterials serving the most populated corridors. This shows that traffic on Route 128 could be reduced by focusing on reducing the number of single-occupant vehicles in the most densely populated corridors. If carpool/vanpool staging centers are located along these corridors outside of Route 128, traffic on Route 128 will be reduced.

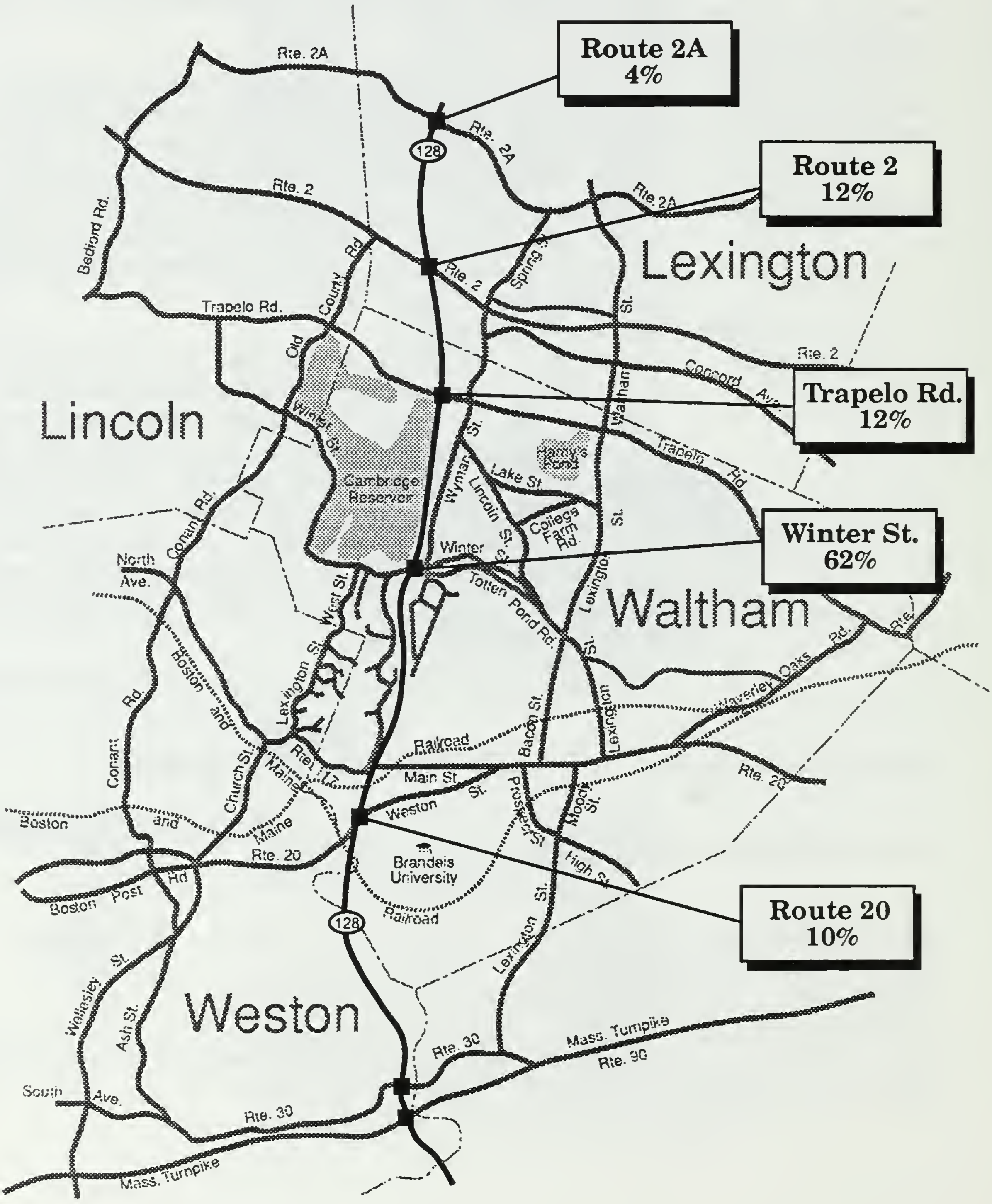
Discussion

As further discussed in Chapter 4, the number of respondents using each entrance to Route 128 served as an indicator of the areas in which ride-sharing would have the greatest potential traffic reduction impacts (see Table 3-2). This information, together with travel time and home location information about the residents of the corridors feeding these entrances, was also used to identify locations with the greatest potential traffic reductions through ridesharing and establishment of a shared-ride staging area.

Table 3-2
Use of Route 128 Entrances

Entrance	*Percentage of Respondents*
Route 3	14%
Massachusetts Turnpike	10%
Route 2	10%
Route 93	6%
Route 20	6%
Route 9	5%

Figure 3-13
Route 128 Exits Used



3.2.3 Potential Use of Commute Alternatives

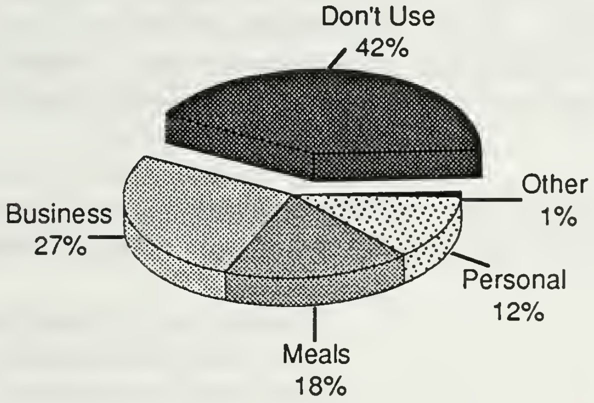
Questions

How frequently do you drive a car during work hours (including lunch) during a typical week (and for what purpose)?
How frequently do you make any stops as you travel home from work during a typical week (and for what purpose)?

Summary of Responses

Not everyone who drives to work uses a car during the work day. In fact, 42 percent of the survey respondents do not use their cars during the work day, and the 58 percent that do only use their cars for an average of 2.5 days per week. The most common use of cars during the day is for company business. Figure 3-14 shows the purposes for which 128 West commuters use their cars during the day.

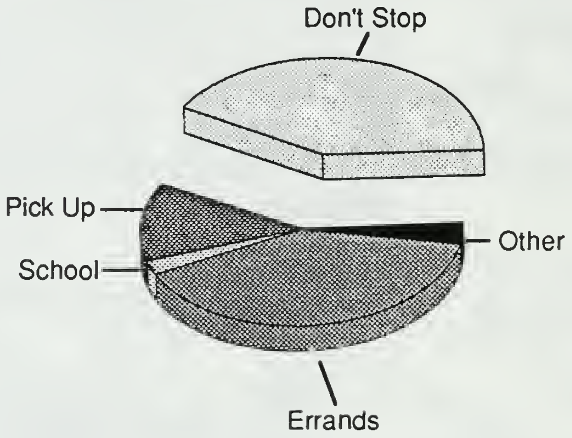
Figure 3-14
Use of Car During Day



Not everyone who drives to work makes stops on the way home. In fact, 41 percent of the survey respondents do not make any stops on the way home from work, and the 59 percent that do only do so for an average of 2.5 days per week.

The most common use of automobiles on the way home from work is for running errands. Figure 3-15 shows the purposes for which 128 West commuters use their cars on the way home from work.

Figure 3-15
Use of Car for Stops on the Way Home



Nineteen percent of the survey respondents do not use their cars either during the day or on the way home from work. These people use their cars simply to get to and from the office.

Discussion

The responses from this question identify four different categories of potential ridesharers:

- Commuters who only use their cars for commuting (i.e., they do not make trips during the day or on the way home from work).

- Commuters who only use their cars for stops on the way home from work (who could make these stops on the way home from the rideshare staging area.

- Commuters who do not use their cars every day (who could participate in rideshare arrangements on a part-time basis).

- Commuters who use their cars, but would not miss them if they were not available.

Survey respondents who do not use their cars either during the work day or for stops on the way home are the best candidates for shared-ride commuting. However, promotional efforts and matching services should not be limited to these individuals. Because the use of staging areas for ride-sharing still allows the individual to stop on the way home from the staging area, any trips (on the way home) that are made at or near the home end of the trip can be made on the way home from the staging area. Additionally, most survey respondents do not use their cars every day. Those who only need their cars selected days of the week could join part-time rideshare groups. Finally, some of the trips made either during the day or on the way home could be conducted at other times.

Question

If your car were not available for your trip to work, and transportation to your work site were to be provided from a central location, which location would be the most convenient for you?

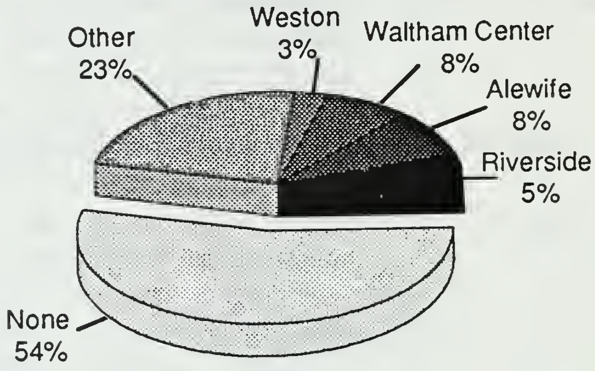
Summary of Responses

Survey respondents were asked to identify the most convenient central location to meet alternative transportation if their cars were not available for the trip to work. Respondents were given the following choices:

- Riverside Station (Green Line)
- Alewife Station (Red Line)
- Waltham Center (commuter rail, local and express bus)
- Weston (commuter rail)
- Other location
- No central location

The most significant number of survey respondents (54 percent) selected "No central location," and the second most significant choice was "Other" (23 percent). Of the locations suggested, Alewife Station and Waltham Center were the two most popular, each selected by eight percent of the survey respondents. Five percent of the survey respondents selected Riverside, and three percent selected Weston. Figure 3-16 shows the number of 128 West commuters selecting each location.

Figure 3-16
Most Convenient Location
for Transportation Center



Discussion

Forty-four percent of the survey respondents identified at least one location that would be a convenient place to get transportation to work. One-half of these respondents said that an existing transit center would be an appropriate location. This finding suggests that shuttle services from existing transit locations could be used to reduce traffic.

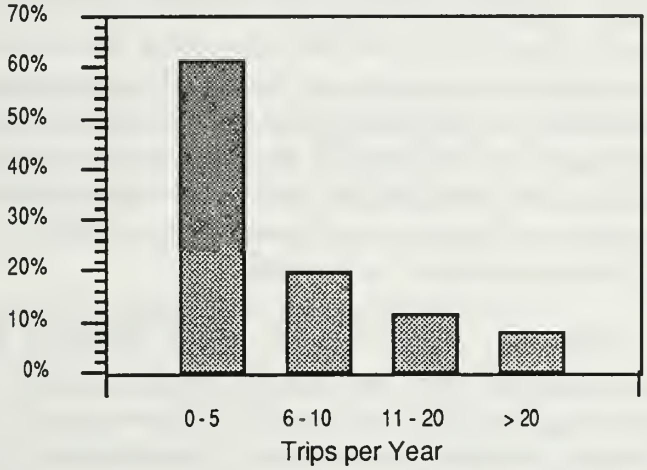
Question

How frequently do you typically travel from your office to Logan Airport?

Summary of Responses

Forty-five percent of the survey respondents said that they do not make any trips from work to Logan Airport and 61 percent of the respondents who do travel from work to the airport only do so between one and five times per year. However, the average annual number of trips made by survey respondents who travel to the airport at least once per year from work is 8.4 trips per year. Figure 3-17 shows the frequency with which survey respondents make trips from their offices to Logan Airport.

Figure 3-17
Annual Frequency of Trips to Logan Airport by Survey Respondents



Discussion

Approximately 23,000 trips are made by survey respondents alone from the 128 West area to Logan Airport each year (or approximately 90 per day). This volume suggests the potential for an airport shuttle operation between the 128 West area and the airport. The shuttle service could be even more successful if opened to the general public and combined with a park-and-ride lot. The Council has recognized the potential for an airport shuttle operation, and has been searching for a park-and-ride lot location.

3.3 Implications of Survey Findings

Commuter trip origins to the 128 West area are very disperse. Most commuters do not have an alternative mode for the work trip, and have become dependent upon their automobiles. In addition, most commuters drive alone to work. The drive-alone mode choice may, in part, be attributable to a perceived lack of alternatives due to a lack of information about ridesharing options. The number of drive-alone commuters may be reduced if new alternatives are provided and commuters become aware of options for forming carpools.

Currently, there are many incentives to continue the drive-alone mode for commuting to the 128 West area, and little or no incentive to rideshare. Incentives for the drive-alone mode choice include minimum travel times, free parking, work schedule flexibility, and the availability of a car for trips during the day or on the way home. Rideshare alternatives have a negative impact on most of these factors, and are not likely to attract many commuters unless conditions change or incentives are provided. The state of Massachusetts, due to its financial crisis, was forced to eliminate its major vanpool incentive program, a subsidy for corporate van purchases. Currently, the only incentives provided by the state are an employer state tax credit for thirty percent of vanpool operating costs and free license and registration of employer vans. Therefore, unless travel times increase significantly on Route 128 and the major highways feeding Route 128 or incentives are provided to make alternative commute modes more attractive, the number of commuters expected to switch to a commute alternative from the drive-alone mode is limited.

However, conditions for some 128 West commuters indicate that they would consider ridesharing if they could find appropriate matches and if ridesharing would not result in too much inconvenience in terms of additional wait or travel time. Conditions for 128 West area commuters which suggest that there may be interest in ridesharing include the following:

- A significant number of commuters (40 percent) spend more than 30 minutes commuting to work, and may be interested in sharing driving responsibilities.
- Many of the roadways used by 128 West commuters are congested.
- Peak traffic volumes are already spread across several hours, and congested conditions persist throughout, suggesting little benefit to off-peak drivers.
- Most (75 percent) of the commuters have little flexibility in setting their work schedules (they are either on fixed schedules or require company approval of their schedules), and are less concerned about having commute time flexibility.

In the long run, highway congestion in the Boston metropolitan area is expected to get worse. Reductions in the number of drive-alone commuters will decrease the number of automobiles on Route 128, since most 128 West commuters use Route 128 for their commute trip. This reduction will result in shorter travel times for all Route 128 commuters.

4 Identification of Commuting Strategies for 128 West Employees

The survey findings were used to identify and develop traffic reduction strategies with the greatest potential for reducing congestion in and around the 128 West area. Traffic reduction strategies could modify travel behavior to reduce the number of vehicles on the road, especially during the peak periods.

4.1 Alternatives for Reducing Single-Occupant Vehicles

Existing travel habits can be changed (to reduce the number of drive-alone commuters) through both transportation supply and demand management. Supply management would provide alternatives to the single-occupant vehicle, including changes in the types of transport options available, e.g., vanpools, shuttle services, park-and-ride facilities, bikeways, and pedestrian improvements, to provide solo drivers with an alternative mode. Demand management focuses on modifying commuting behavior and includes alternatives such as ridesharing incentives, flex time policies, parking fees, restrictions or reductions, or other strategies which provide incentives to reduce the number of autos on any given link at a particular time.

While both supply and demand management strategies have proven effective in reducing congestion, it should be noted that it is difficult to implement both simultaneously. Demand management actions which spread out commuter demand (e.g., flex time) may diminish the critical mass required for effective ridesharing or transit services. However, if well orchestrated and appropriately marketed, these strategies can be used together to meet varied commuter needs. While the viability of both supply and demand management options have been examined in light of the survey findings, the major focus of the study has been on the identification of innovative supply management strategies: specifically, park-and-ride services, shuttle bus operations, and carpool and vanpool matching and staging areas to reduce the number of drive-alone commuters. It should be noted, however, that these strategies are most effective when implemented along with demand management strategies which provide incentives to commuters to choose high occupancy modes.

Supply management strategies aim at providing alternative, high occupancy forms of transportation to attract drive-alone commuters.

Previous studies have determined that commuters who drive alone do so for one or more of the following reasons:

- They want direct, no-transfer transportation.
- They do not want to be dependent on others.
- They need their cars during the day or for stops on the way to work or home.
- They need flexibility in the time they arrive at or depart from work.
- They do not want to increase the time it takes to get to work.
- They believe driving alone is the only option available.

Thus, alternative forms of transport, in order to be attractive to drive-alone commuters, must have a minimal negative impact on these aspects. It is extremely important that alternative modes provide the most direct, fast, and flexible transport possible.

The supply management alternatives that were explored for 128 West commuters include strategies to increase origin demand density by establishing central locations for commuters to meet. These commuters would then use a shared-ride mode to commute to work. These locations can be grouped into the following two categories:

- Remote staging areas for carpooling, vanpooling and park-and-ride (all of these options will be referred to as remote park-and-ride in the remainder of this report)
- Shuttle bus operations from existing transit centers

The applicability of these strategies for 128 West commuters is discussed below.

4.1.1 Remote Park-and-Ride

Previous studies have shown that the people most likely to use commute alternatives live significantly further away from the workplace, are concerned about the cost of commuting (e.g., where parking costs are significant), and do not have a car available for the work trip commute. Since parking at most employment locations in the 128 West area is free and abundant, and nearly all employees have a car for work, the most important variable for identifying potential rideshare strategies is commuting distance. In the longer term, commute alternatives could provide new opportunities to those without access to an automobile and expand the labor pool available to the 128 West employers.

Major deterrents to ridesharing include increased travel time associated with pick-up and drop-off, distances between potential ridesharers, and the absence of a convenient location to meet and park unneeded cars during the day. These barriers can be reduced by providing central locations (staging areas) for commuters to meet to form carpools and vanpools or to board buses destined for the 128 West area. These locations can include new lots or the use of existing lots at shopping centers, movie theaters, etc., which are underutilized during the day.

Another problem associated with traditional ridesharing arrangements is the lack of flexibility in the work schedule from day to day. Most carpools and vanpools are set up so that the same group of commuters travel together to and from work at the same times every day. However, flexibility can be provided by establishing carpools and vanpools that allow members to participate on a part-time or one-way basis. Although these types of ridesharing arrangements are more complicated to organize, they better match the travel needs of commuters and therefore are more successful.

Rideshare options have historically been most successful when arranged on the basis of a single company. This is generally due to convenience, but also attributable to difficulties in developing matches between companies. However, the 128 West Council, in conjunction with CARAVAN, provides an excellent opportunity to reach a larger market across company boundaries in the Waltham area and to implement part-time vanpools. In order to do this, the 128 West Transportation Council needs to continue to provide commuters with:

- information about available alternatives, and

- matching of potential ridesharers in respect to proximity of home and work locations as well as work schedules.

Additionally, the Council should work with the state, local communities, and private companies to establish:

- meeting places, preferably with parking, close to commuters' homes or along routes to work with minimum deviation from drive-alone routes; and

- incentives to compensate for increased travel time and reduced flexibility.

4.1.2 Shuttle Services

However, even in the most progressive cases, carpool and vanpool participants have limited flexibility in their work schedules from day to day. People with unpredictable or varying schedules would not be able to utilize carpool or vanpool arrangements. For these persons, shuttle services would provide an option which allows greater flexibility:

- The employee is not restricted to a single, pre-specified time to arrive and depart work, because the employee can take any bus.
- The employee is able to split the trip to work from the trip home.
- Employee departure times are not dependent upon others because riders are independent from one another and the shuttles leave at scheduled times (independent from the riders).

The feasibility of shuttle services is limited to close-in locations because they would be prohibitively expensive from longer distances. For example, a shuttle operating every 15 minutes from a location 45 minutes from the 128 West area would require six vehicles and six drivers. Additionally, a relatively dense population of commuters must be present in order for a shuttle operation to work efficiently. These services should be located at specific collector locations, convenient to large concentrations of commuters, within close-in zones as well as at existing commuter rail or rapid transit stations. Potential locations include rail and rapid transit stations, park-and-ride lots, and underutilized private parking lots.

The survey findings indicate that 44 percent of the survey respondents live in towns located inside Route 128. Many of these people are conveniently located near some form of public transportation, including commuter rail, rapid transit, or local or express buses, and may best be served with shuttle buses from existing transit locations. Additionally, shuttle buses could be used to transport commuters who live outside of Route 128 and take commuter rail to stations near the 128 West area. The shuttle alternative focuses on the establishment of shuttle bus services from existing transit locations to the 128 West employment center. Locations for shuttle bus operations would be limited to stations near Route 128 or the 128 West area so as to allow reasonable frequencies with a small number of vehicles. Shuttle bus departures would be timed to coordinate with transit schedules so as to minimize transfer times. This option allows commuters who live near transit to commute auto-free.

4.2 Potential Users of Commute Alternatives

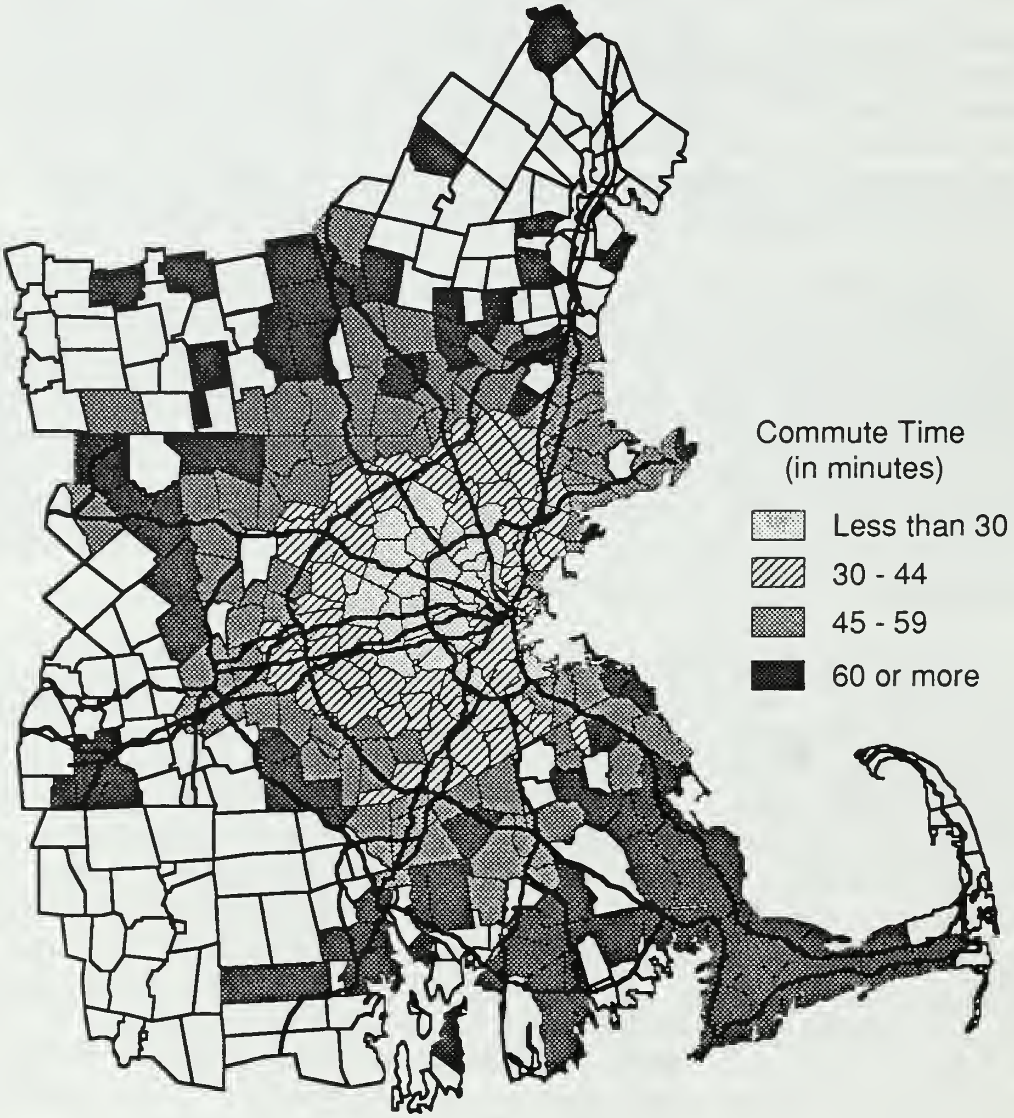
Because employees who spend longer commuting to work are more likely to use commute alternatives, further analyses were focused on commuters who spend more than 30 minutes commuting to work. As shown in Figure 4-1, travel times increase in rings with distance from Waltham. However, within each ring, travel times are shorter for respondents commuting from towns located along the major arterials feeding Route 128. This is because commuters who live near the arterials spend less time on local access roads, and therefore have more direct routes to work.

Almost all respondents who live inside Route 128, with the exception of those who live on the North and South shores, spend 30 minutes or less commuting to work. Additionally, towns within Route 128 are some of the densest hometown locations of the 128 West commuter-shed, and many are served by the MBTA. Because of these factors, and the limited amount of space available for park-and-ride lots, commuters from this area are less likely to be interested in ridesharing strategies. A more appropriate strategy for this area is to establish shuttle bus services from existing transit centers.

The hometown locations of commuters most likely to use park-and-ride lots to meet a carpool or vanpool, or catch a shuttle bus include areas around and outside Route 495 as well as the North and South shores. Commuters from these towns generally use the major arterials, many of which are congested, for their commute trips. Therefore, since commuters from these areas are generally converging at or near these arterials, appropriate locations for park-and-ride lots, in terms of convenience to commuters and reductions in traffic congestion, would be near commonly used entrances to the major arterials.

Since most trip origins of 128 West commuters traveling more than 30 minutes to work are near or outside of Route 495, potential locations for remote park-and-ride lots are at or near the intersections of the major arterials feeding Route 128 (Routes 3, 2, 20, 95, 1, and 93 and the Massachusetts Turnpike) with Route 495 or, in the case of the South Shore (Routes 95, 1, 3, and 24), with Route 128. Park-and-ride lots in these areas would provide convenient locations for employees to leave their cars during the day in order to share rides into the 128 West area. These lots would minimize the delay associated with shared-ride transportation, as they would be located along existing commuter routes. Additionally, they would serve those commuters who are travelling the greatest distances to work and, therefore, those who are most likely to be interested in shared-ride transportation. Finally, these lots could be used by commuters to other destinations in the metropolitan area to even further reduce traffic levels on commuter roadways.

Figure 4-1
Average Commute Time
of Survey Respondents
by Hometown



4.3 Alternatives for 128 West Commuters

4.3.1 Approach to Identification of Alternatives

A summary of the survey respondents' use of Route 128 was used in order to determine the locations with the greatest potential for implementing commute alternatives. A summary of the number of commuters using the various entrances to Route 128 was used to identify the locations most convenient to the largest number of commuters. This information, combined with the hometown density data, suggests that the following corridors would offer the highest concentrations of commuters:

- Route 3, north of Route 128
- Route 90, Massachusetts Turnpike, west of Route 128
- Route 95, south of Route 128
- Route 93, north of Route 128
- Route 2, both east and west of Route 128
- Route 20, west of Route 128
- Route 9, east of Route 128
- Route 24, south of Route 128
- Route 3/93, south of Route 128

Additionally, rapid transit and commuter rail stations located near Route 128 and the 128 West area and serving the major commute corridors were identified as potential sites for shuttle bus services. This analysis identified the following locations as potential sites:

- Mishawum commuter rail station (Lowell Line)
- Alewife Station (Red Line)
- Riverside Station (Green Line)
- Waltham Center commuter rail station (Fitchburg Line) and bus terminal
- Kendall Green commuter rail station (Fitchburg Line)
- Auburndale commuter rail station (Framingham Line)
- Reading commuter rail station (Haverhill/Reading Line)
- Route 128 commuter rail station (Attleboro/Stoughton Line)

In order to assess the potential locations for shuttle bus services or remote park-and-ride lots, the 128 commuter-shed was divided into corridors based on commuter travel patterns. For the most part, these corridors are comprised of contiguous towns along the major transportation corridors, which represent spokes from Route 128. The four most densely populated and heavily travelled commute corridors are:

- Route 3, north of Route 128,
- Route 90 (and 20), west of Route 128,

- Route 93, north of Route 128, and
- Route 95 (and 1), south of Route 128.

The following sections identify and evaluate remote park-and-ride or shuttle service strategies for the most significant commuter corridors. Additionally, commuters who live inside Route 128 are considered as potential shuttle users. In order for shuttle services to compete with the drive-alone mode, travel times must be kept to a minimum. To this end, shuttles would need to be timed to minimize commuter wait time and the dwell time associated with the number of stops. While it is important to minimize the number of stops made by the shuttle, it is also important to assure that service is located close to employee work sites. In order to minimize the travel time associated with stops yet still maximize service coverage, the 128 West area was divided into four sectors, each of which would be served by a different shuttle.

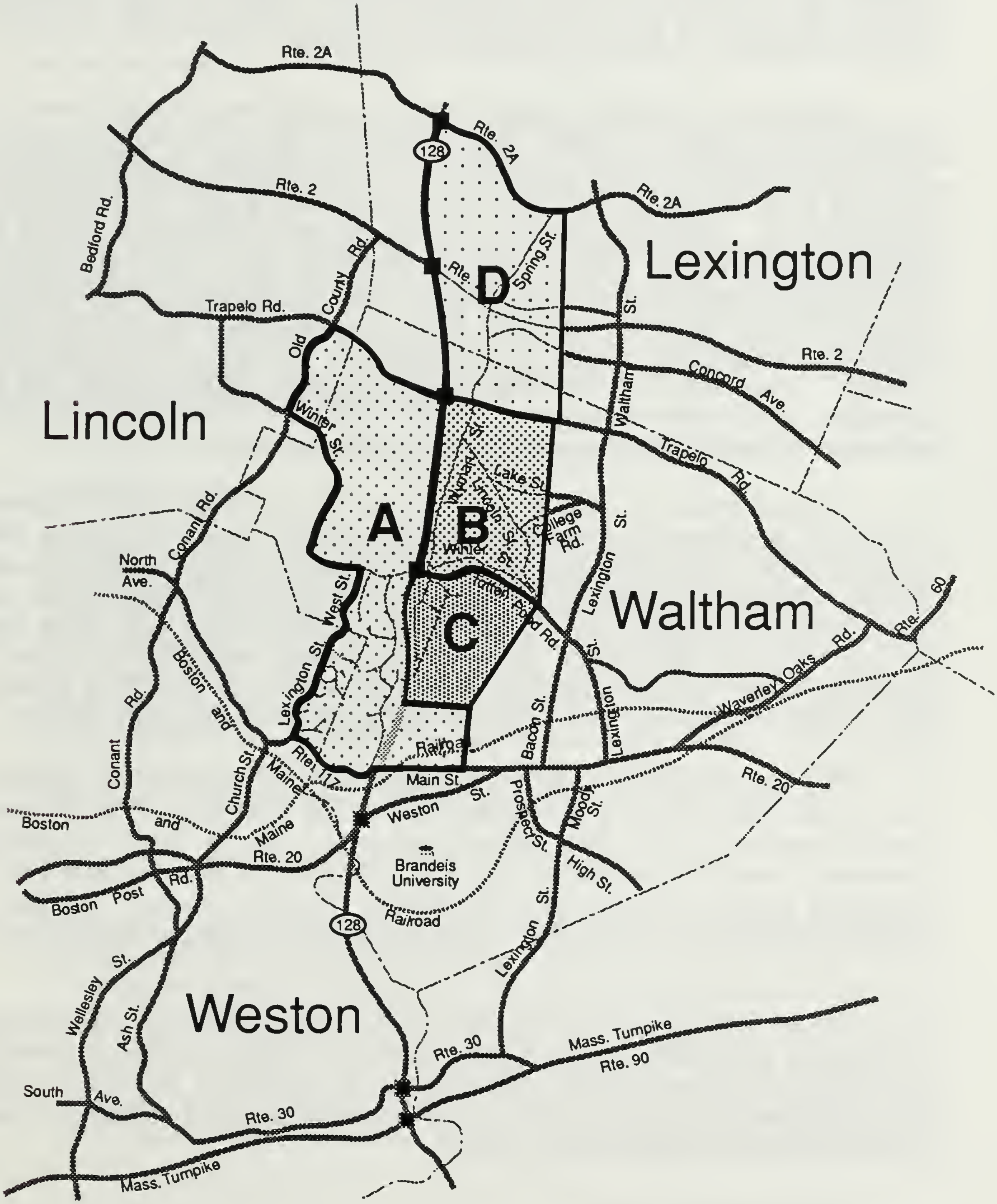
Figure 4-2 shows the four sectors of the 128 West area used for the analysis. The sectors are defined in part by the intersections of Route 128 with Trapelo Road and Totten Pond Road, with one exception: the Polaroid Main Street site is included in Sector A, so that it is grouped with the other Polaroid sites. Each shuttle would make only four stops (at the largest companies or complexes) in the respective sector, so as to minimize running time.

4.3.2 Evaluation of Alternatives

As previously discussed, supply management alternatives for the 128 West area include remote park-and-ride lots, which would serve as carpool, vanpool, or shuttle bus staging areas, and shuttle bus services from existing transit locations. The two major criteria used to evaluate the potential success of commute alternatives are comparisons of commute time and cost with that of the drive-alone mode. Because all park-and-ride alternatives increase travel time by the time required to access and depart the park-and-ride lot as well as the time required to transfer vehicles, the travel time impacts of these options are not evaluated on an individual basis. Only rapid transit and commuter rail options are evaluated in terms of travel time impacts.

In all cases, the remote park-and-ride lot alternative would add a minimum of five minutes to drive-alone travel times to allow ridesharers to meet at the park-and-ride lot. In some cases the commuter may have to deviate from the direct commute trip, adding even more time. In the best case, where a commuter would save 50 miles (round trip) for each trip made in a fellow ridesharer's car, the commuter would save $6.25 (in operating costs) each day he or she does not drive (or $11.00 in fully allocated costs of

Figure 4-2
128 West Employment Center Sectors



vehicle ownership and operation).[1] If this commuter participated in a full-time three-person carpool, savings would amount to less than $1000 ($1,760*) a year. However, in most cases carpools include only two members. In a two-person carpool, even if the individuals participate in the carpool every work day, each participant would save less than $750 ($1,320*) per year. It is unlikely that the carpool would operate every work day, due to the occasional need to drive alone, sick days, different vacation schedules, etc., so actual savings realized by carpool participants would be less.

Because most 128 West commuters live in suburban locations, many of which are not served by transit, they would own the car currently used for commuting even if they did not use it to commute. Additionally, they would have to own the car to participate in a carpool which shares driving responsibility. Therefore, the cost savings for most commuters would be limited to the variable costs of vehicle operation. Few commuters would realize the cost savings associated with the full cost of owning and operating an automobile, and even those who would may not perceive all auto costs. Therefore, alternatives should be evaluated on the basis of operating cost savings. (However, fully allocated ownership and operating costs will be identified for comparison purposes. In the remainder of this report, the fully allocated cost will follow the operating cost in parentheses.)

Options which provide shuttle services from existing transit locations would add a minimum of five minutes' transfer time and wait time as well as access time to the transit system. In many cases, in-vehicle travel time also would be longer than the drive-alone mode. After paying transit fares, the rapid transit or express bus to shuttle alternative would only offer cost savings over the drive-alone mode to commuters travelling six miles or more to the 128 West area and only if shuttle service was free. It is unlikely that the service would be provided free of charge, given the costs involved.

The shuttle which currently operates from Alewife Station provides four trips in the morning and three trips in the afternoon. The morning shuttle operates at forty-five-minute headways, and the afternoon shuttle operates at one-hour headways. This service is operated at an average cost of $3,900 per month, or slightly over $25 per trip. Only 29 percent of this cost is covered by fares, and 20 percent is subsidized by the Transportation Council.

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[1] Cost calculations are based on the 1989 American Automobile Association publication, "Your Costs of Driving." Operating costs represent the average cost per mile for gasoline, oil, maintenance, and tires. Fully allocated costs are operating costs plus insurance, license and registration fees, taxes, depreciation, and finance charges.

*Fully allocated costs.

The remaining 51 percent is subsidized by the Urban Mass Transit Administration's Private Enterprise Program. Any increase in frequency would significantly impact costs, as more vehicles and drivers would be required. Likewise, any new shuttle service which would either operate more frequently or require longer travel times would require more resources. In the case of commuter rail options, this distance would be even greater. Further, because many of the costs of driving alone are not obvious and transit costs are readily identified, the perceived cost of transit is higher for most commuters.

On this basis, park-and-ride and shuttle alternatives would offer only modest cost savings and no travel time savings in comparison with the drive-alone mode. As a result, only commuters most concerned with cost or car mileage would view this option favorably. Therefore, to increase the attractiveness of alternative modes, it would probably be necessary to provide incentives such as exclusive high occupancy vehicle lanes, free or subsidized transit passes, and parking fees or restrictions. Additionally, if shuttle fares are charged, they should be lower than the drive-alone cost of commuting. Without these incentives, the number of commuters expected to use any of the commute alternatives would be small.

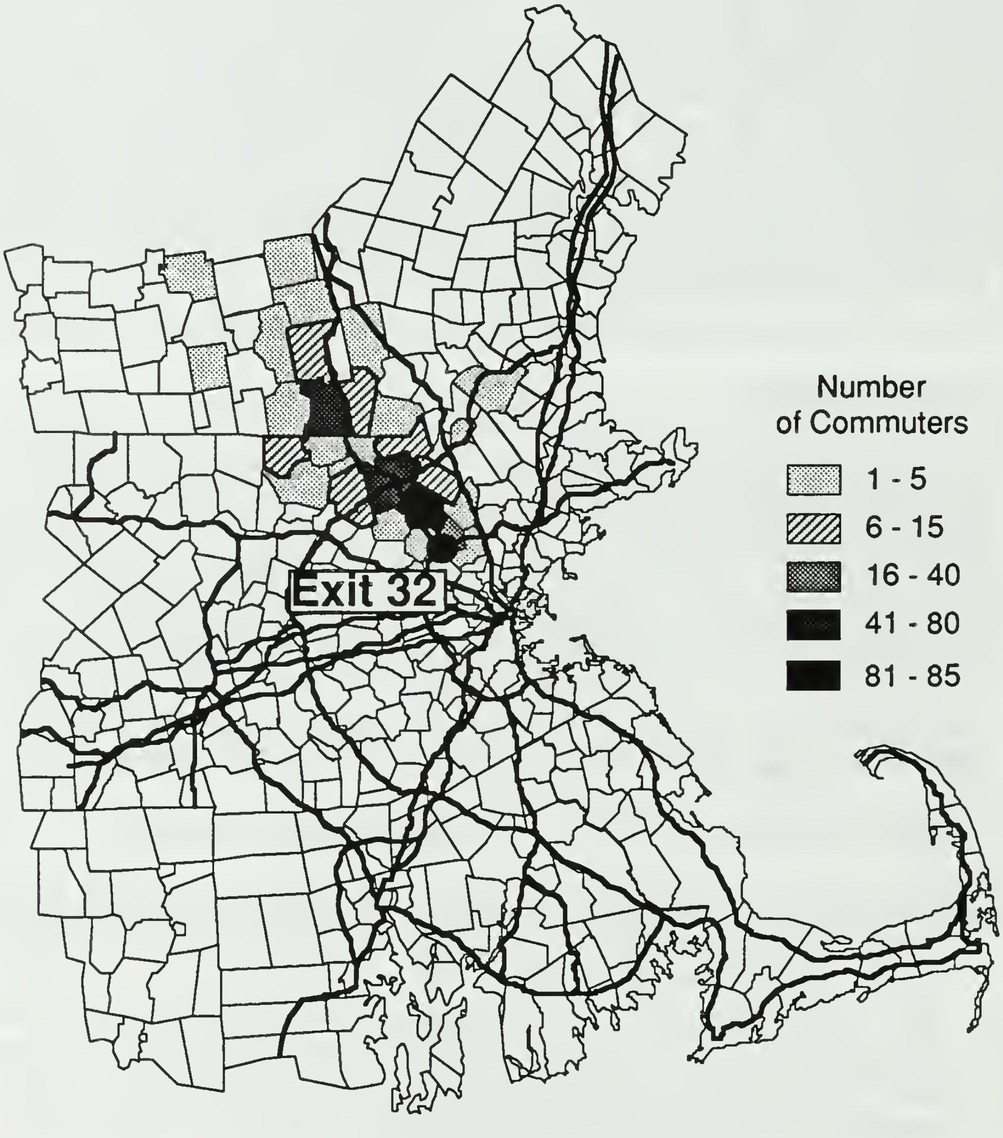
Route 3 Corridor

Route 3, between New Hampshire and Burlington, was identified as the most commonly used entrance to Route 128, and this corridor includes some of the most densely populated towns (in terms of number of 128 West commuter residents) in the 128 West commuter-shed (see Figure 4-3). Most of the survey respondents using Route 3 to commute to the 128 West area live in towns bordering Route 3 or neighboring towns. Most (62 percent) of the commuters using Route 3 live outside of Route 495, and 35 percent live between Routes 128 and 495. Only 3 percent of the commuters entering Route 128 at Route 3 live inside Route 128.

Three alternatives were identified for the Route 3 corridor:

Park-and-ride lot near the intersection of Routes 3 and 495 for carpool, vanpool, and shuttle bus staging. Two existing, underutilized lots were identified at this location: (1) the movie theater on Route 110 at the Route 495/Route 3 interchange; and (2) the Wang Company parking lot, on Route 110 between the Route 495/Route 3 interchange and the Lowell Connector. Much of the Wang lot is unused, and a specific area to the rear of the lot (away from the Wang offices) could be used for park-and-ride. Either location would save passengers 36

Figure 4-3
Hometowns of Commuters
Entering Route 128 at Route 3



miles and \$4.50 (\$7.90*) each day they do not drive to the office. Thus, a person carpooling with one other person from this lot would save a maximum of \$540 (\$950*) per year. Due to the proximity to Route 3 and 495, the additional time would be small.

Park-and-ride lot near the intersection of Routes 3 and 128 for carpool, vanpool and shuttle bus staging. The Burlington Mall parking lot would be a potential site for park-and-ride. This location would save passengers 14 miles and \$1.75 (\$3.10*) each day they do not drive to the office. Thus, a person carpooling with one other person from this lot would save a maximum of \$210 (\$370*) per year. However, because Route 3 is more congested than Route 128, this location is at the end of the worst part of the commute for people using Route 3. Therefore, this location is unlikely to attract Route 3 commuters.

Commuter rail to Mishawum, shuttle to 128 West area. Part of the Route 3 corridor is served by the Lowell commuter rail line, which runs through Billerica and Lowell. This line has a station (Mishawum) in Woburn near Route 128. Some of the Route 3 commuters (particularly those who live in Billerica, Lowell, or towns further out) might find it convenient to take commuter rail to Mishawum if shuttle service were provided between the train station and the office. While this alternative might offer slight in-vehicle travel time savings to commuters, these savings would be offset by access and wait times. Additionally, flexibility would be limited by the 30 minute peak period headways. Finally, the only commuters who are likely to realize any benefit from this alternative are those who live within walking distance of the stations on the Lowell line and find the rail schedule convenient. This number is limited (only 65 survey respondents were commuters from Lowell) and could not support an efficient shuttle bus operation.

Of the three alternatives evaluated for Route 3, the park-and-ride lot at the Route 3/495 interchange offers the greatest potential for success; cost savings would be highest and the additional travel time required the smallest. The other alternatives would offer significantly smaller cost savings and longer travel times. In the longer run, a remote park-and-ride program near the Route 495/3 interchange could be combined with incentive programs which give priority to high occupancy vehicles to provide both cost and travel time savings. With respect to the 128 West area, this corridor probably has the greatest potential in the region, due to the large concentration of 128 West commuters who live along Route 3, the severity of congestion on Route 3, and the consequent potential impact on travel times. Utilization of commute alternatives in the Route 3 corridor would not only reduce traffic congestion on Routes 3 and 128, but would also impact local traffic volumes in the 128 West area. As shown in Figure 4-4, utilization of commute alternatives would most significantly impact Route 128 traffic, but would also lead to traffic reductions on all local (128 West) roadways.

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*Fully allocated costs (see page 42, footnote 1).

As shown in Figures 4-4 and 4-5, the destinations of Route 3 commuters are spread throughout the 128 West area. The most significant proportion (41 percent) of commuters using Route 3 are destined for Sector A (the area west of Route 128 and Polaroid), followed by Sectors B (the area to the east of Route 128 between Totten Pond Road and Trapelo Road) and D (the area to the east of Route 128 between Trapelo Road and Route 2) with 28 percent and 27 percent, respectively. Finally, the smallest proportion (4 percent) is destined for Sector C (the area to the east of Route 128 between Main Street and Trapelo Road, excluding Polaroid).

This analysis shows that the greatest potential for ridesharing and/or shuttle service between the Route 3 corridor and the 128 West area is with employees of companies located to the west of Route 128 who live in towns near or outside Route 495. Therefore, marketing efforts should be directed at these commuters in order to maximize the potential gain.

Massachusetts Turnpike (Route 20, Route 9) Corridor

The Massachusetts Turnpike corridor commuter-shed overlaps with those of Routes 20 and 9. Most commuters using the Massachusetts Turnpike live outside of Route 495. Commuters using Route 20 generally live closer in, between Routes 128 and 495, and those using Route 9 generally live inside Route 128. Because commuters using the Massachusetts Turnpike live the furthest out and spend the greatest amount of time commuting to work, the primary candidates for ridesharing in this corridor are Massachusetts Turnpike commuters. However, as shown in Figure 4-6, most commuters using the Massachusetts Turnpike live in towns bisected by or outside of Route 495, but the most significant towns (in terms of number of employees) are Framingham and Boston.

Commuters Living Inside Route 128

Twenty-four percent of the survey respondents who use the Massachusetts Turnpike or Route 20 to enter Route 128 live inside Route 128, and 85 percent of the commuters using Route 9 live inside Route 128. Most of the commuters who use the Massachusetts Turnpike, Route 20 or Route 9 to commute to the 128 West area who live inside of Route 128

Figure 4-4
Route Segments Used by Survey Respondents Entering Route 128 at Route 3

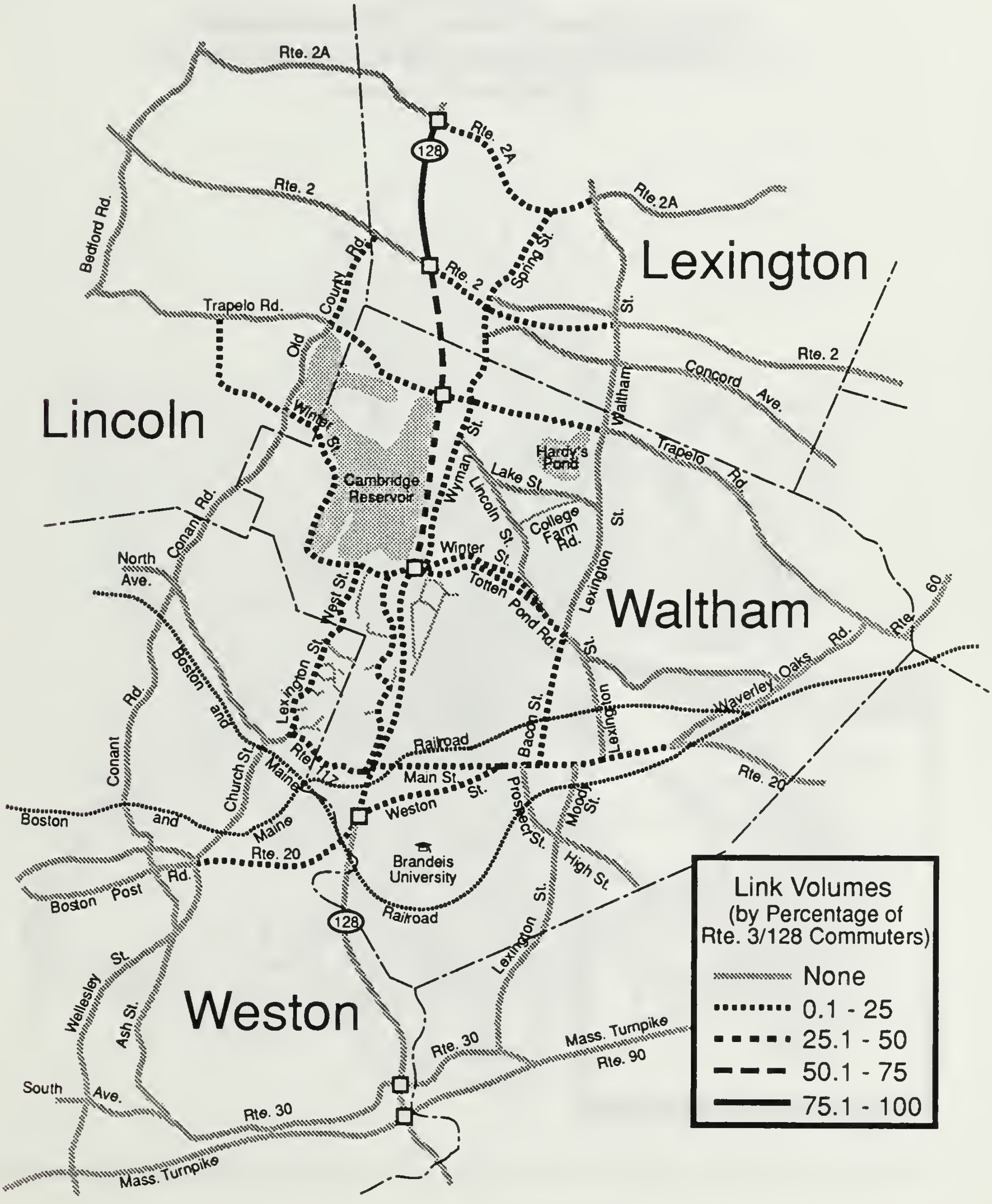


Figure 4-5
Destinations of Survey Respondents Entering Route 128 at Route 3: Relative Volumes

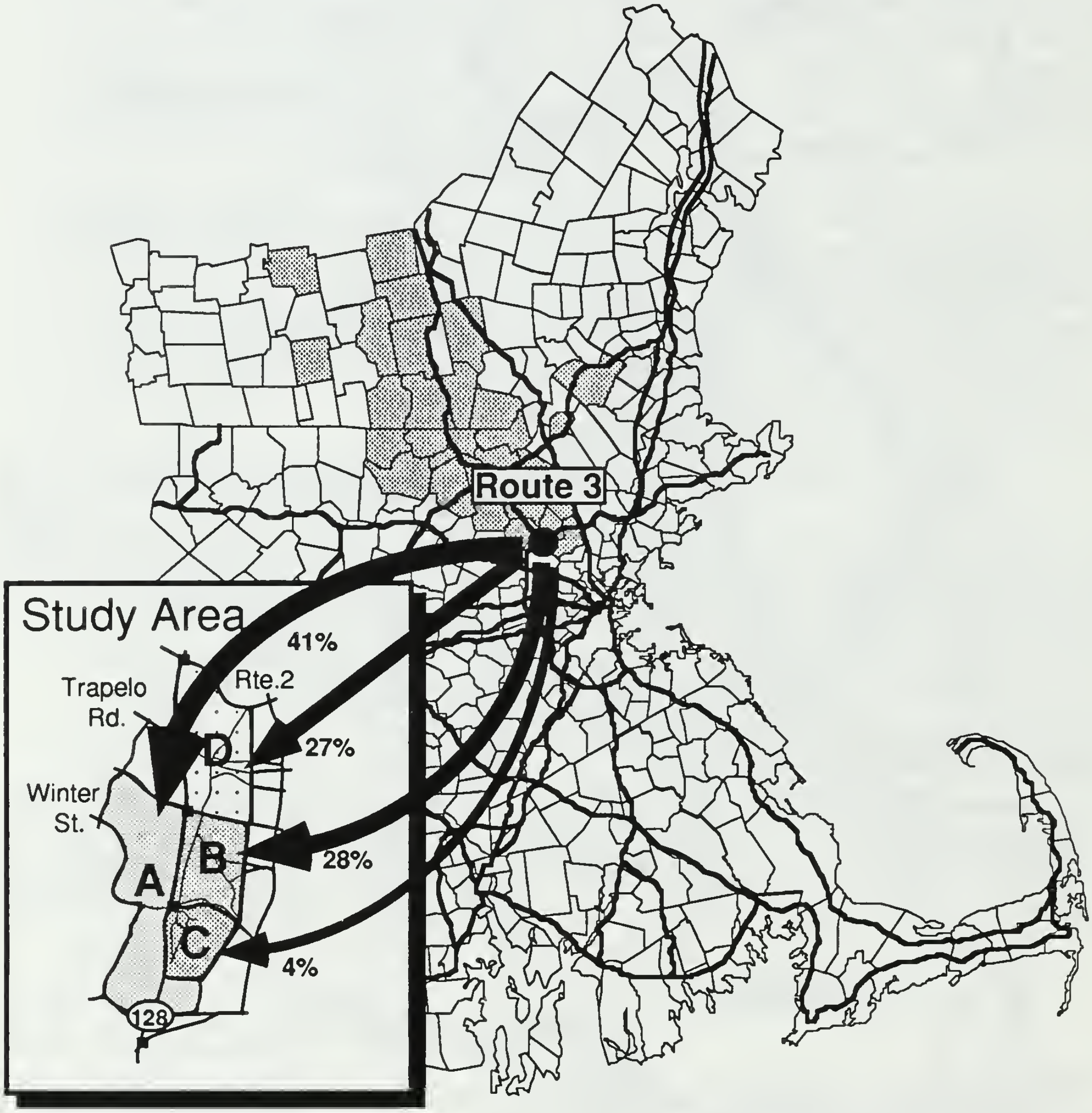
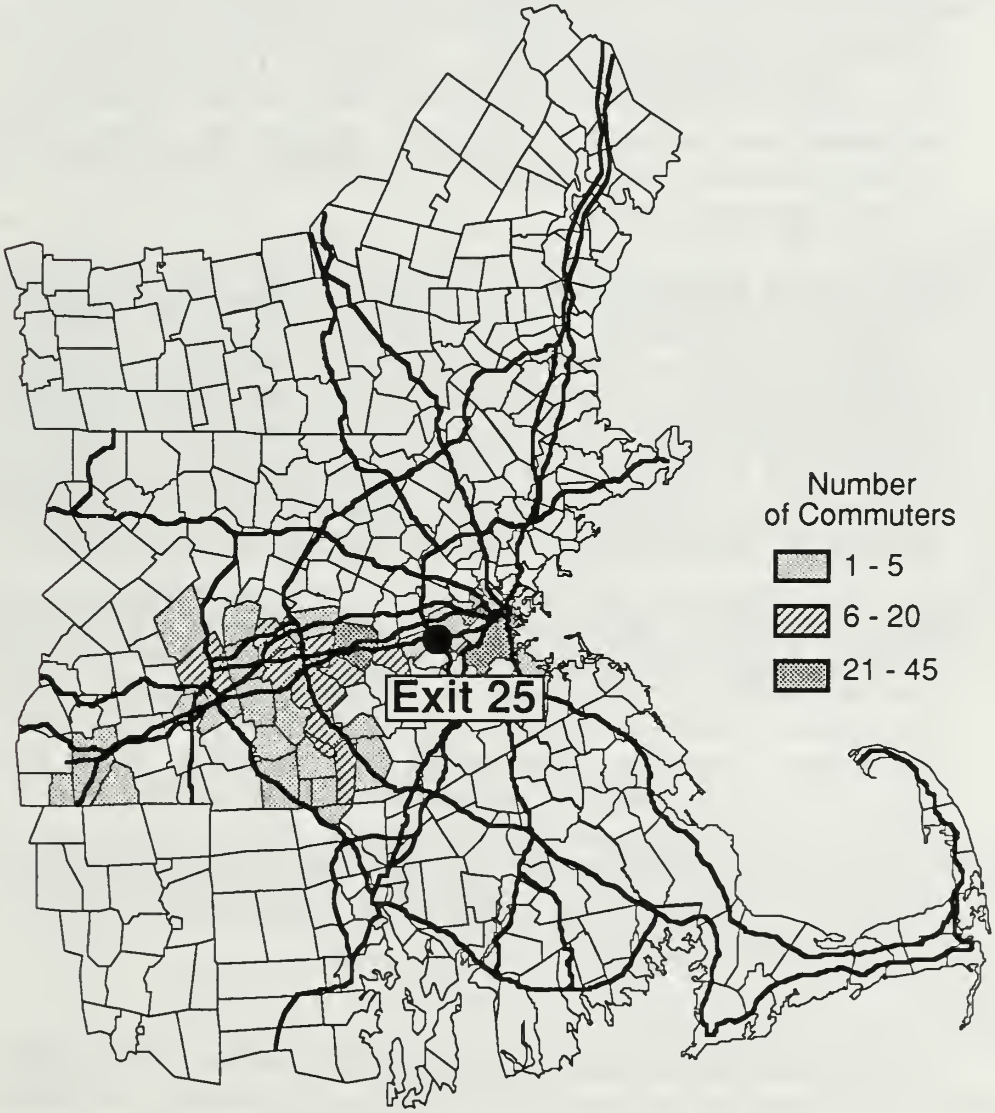


Figure 4-6
Hometowns of Commuters Entering Route 128 at the Massachusetts Turnpike



live in Boston, and many of these commuters have access to the MBTA system. Commuters with access to the MBTA would best be served by shuttle services from existing collector locations to the 128 West area.

Five alternatives exist for this corridor, each serving a different segment of the 128 West commuters who live in the corridor. The evaluation of these alternatives,[2] presented below, shows the minimum and maximum travel times for shuttle service to the sectors. The drive-alone commute time shown is the average commute time for residents of the corridor.

Red Line to Alewife Station, shuttle to 128 West area. Total travel time for this trip (from Park Street Station) would be 42 to 43 minutes, compared with an average 34 minute drive-alone commute time for 128 West commuters who live in Boston. The round-trip Red Line fare (from downtown) is $1.50 and therefore this alternative would represent cost savings for commuters who live six miles or more from work. Of course, travel times for commuters living closer to Waltham on the line would be less.

Green Line to Riverside Station, shuttle to 128 West area. Due to the frequency of stops on the Green Line as well as the interaction with automobile traffic, no in-vehicle travel time savings would be realized in this alternative. Total travel time for this alternative (from Park Street Station) would be 61 to 62 minutes, compared with a 34 minute drive-alone commute time. The round-trip Green Line fare (from downtown) is $1.50 and therefore this alternative would represent cost savings for commuters who live six miles or more from work.

Express bus (MBTA Route 300) from downtown Boston to Waltham Center, shuttle to 128 West area. This route starts in downtown Boston, making several stops. In-vehicle travel times are higher than for drive-alone commuters, as commuters must leave from downtown locations. Total travel time would be 44 to 45 minutes from Federal and Franklin streets and 38 to 39 minutes from Kneeland Street, compared with a 34 minute drive-alone time. Thus, commuters located near the Kneeland Street stop would find a small difference in travel time between the Route 300/shuttle option and the drive-alone option.

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[2] Each alternative assumes a five minute access time to the MBTA, wait time equal to one-half the headway, and a one or two minute transfer time (to the shuttle bus, as shuttle buses would be scheduled to coordinate with MBTA service). Additionally, the analysis assumes that four different shuttles would operate, each to a different sector of the 128 West area.

Express bus (MBTA Route 305) from downtown Boston to Waltham Center, shuttle to 128 West area. This route starts in downtown Boston, making several stops. In-vehicle travel times are higher than for drive-alone commuters, as commuters must leave from downtown. Total travel time would be 51 to 52 minutes, compared with a 34 minute drive-alone time.

Commuter rail (North Station) to Waltham Center or Kendall Green station, shuttle to 128 West area. Because the rail line between North Station and Waltham is circuitous, even commuters who live within walking distance of North Station will not realize travel time savings in this alternative. In fact, in-vehicle travel times are comparable with the drive-alone mode, but transfer and wait times will be higher than for drive-alone commuters. Total travel time would be 44 to 45 minutes, compared with a 34 minute drive-alone time.

Commuters Living Outside Route 128

Few Route 9 commuters live outside Route 128, but the most significant proportion (76 percent) of commuters who use the Massachusetts Turnpike and Route 20 to commute to the 128 West area live outside Route 128. Route 20 commuters live closer in than Massachusetts Turnpike commuters. Most (73 percent) of the Route 20 commuters live between Routes 495 and 128, but only 33 percent of the Massachusetts Turnpike commuters live within this ring. The largest proportion of the commuters using the Massachusetts Turnpike or Route 20 who live between Routes 128 and 495 live in Framingham. Forty-three percent of the Massachusetts Turnpike commuters live outside Route 495. These findings suggest the need to emphasize the Massachusetts Turnpike as the major commute road for those who live in towns around and beyond Route 495, and the need to focus on Route 20 for those who live in towns between Routes 128 and 495.

Three alternatives were identified for this corridor:

Park-and-ride lot near the intersection of Routes 90 and 495 for carpool, vanpool, and shuttle bus staging. This would save commuters 44 miles and \$5.50 (\$9.70*) each day they do not drive to the office. Thus, a person carpooling with one other person from this lot would only save a maximum of \$660 (\$1160*) per year. Travel time would be increased by the detour to the park-and-ride lot as well as transfer time.

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*Fully allocated costs (see page 42, footnote 1).

Commuter rail to Auburndale, shuttle to 128 West area. Some of the towns in the Massachusetts Turnpike corridor are served by the Framingham commuter rail line. This line has a station in Newton (Auburndale), conveniently located near the intersection of Route 128 and the Massachusetts Turnpike. Commuters from Framingham, Natick, and towns further out might find it convenient to take commuter rail to Auburndale if shuttle service were provided from the Auburndale station to their work sites. This alternative would save in-vehicle travel time, but would increase total travel time due to access, wait, and transfer times. Residents of Framingham would benefit the most from this alternative, but they would be better served by a park-and-ride lot.

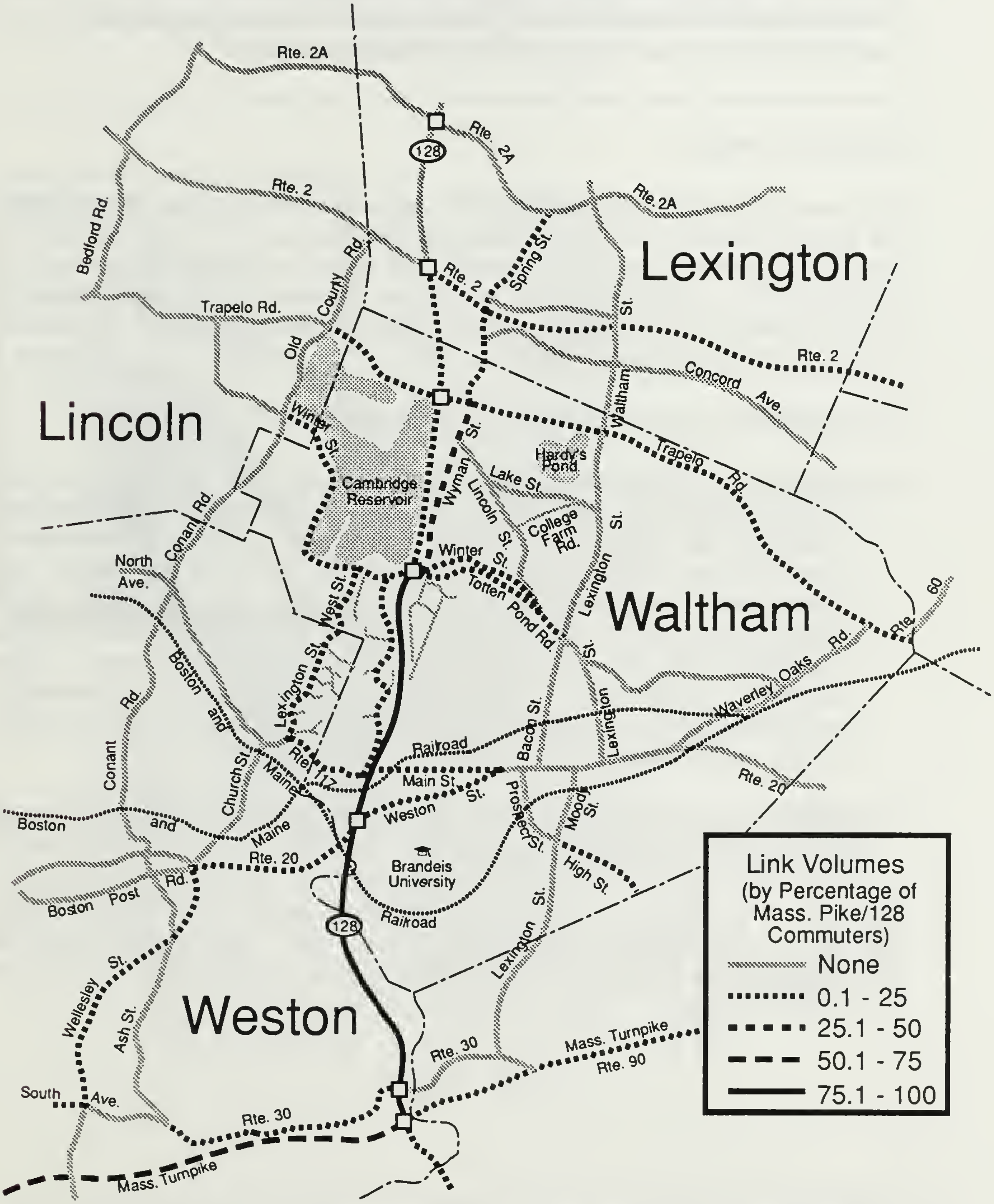
Park-and-ride lot in Framingham for carpool, vanpool, and shuttle bus staging. This would save commuters 28 miles and $3.50 ($6.15*) each day they do not drive to the office. Thus, a person carpooling with one other person from this lot would only save a maximum of $420 ($740*) per year. Travel time would be increased by the detour to the park-and-ride lot as well as transfer time.

Remote park-and-ride options could provide some cost incentive over the drive-alone mode, but no existing lots were found as suitable staging areas. All of the transit/shuttle options increase perceived commuting cost, so few commuters would be expected to use the commute alternative unless incentives are provided.

For commuters living inside Route 128 who are within walking distance of MBTA service, the convenience offered by the transit/shuttle option, especially if MBTA passes were subsidized by employers, could outweigh the additional travel time. This would reduce both actual and perceived commuting costs, and may allow commuters to decrease the number of automobiles owned. The most significant savings for commuters living outside of Route 128 would be reduced traffic on Route 128.

Figure 4-7 shows the local 128 West roadways used by Massachusetts Turnpike commuters. While the use of commute alternatives by Massachusetts Turnpike commuters would result in traffic reductions on all local 128 West roadways, the most significant traffic reductions would occur on Route 128 and Wyman Street.

Figure 4-7
Route Segments Used by Survey Respondents Entering Route 128 at the Massachusetts Turnpike



The most significant proportions (41 percent) of commuters using the Massachusetts Turnpike are destined for Sectors A (the area west of Route 128 and Polaroid) and B (the area to the east of Route 128 between Totten Pond Road and Trapelo Road), with 41 percent and 38 percent, respectively (see Figure 4-8). Sectors D (the area to the east of Route 128 between Trapelo Road and Route 2) and C (the area to the east of Route 128 between Main Street and Trapelo Road, excluding Polaroid) attract the smallest proportions, with 13 and 8 percent, respectively.

Route 93 Corridor

The most significant proportion (45 percent) of commuters using Route 93 to enter Route 128 live between Routes 128 and 495 (see Figure 4-9). However, many of these commuters live in towns bordering or bisected by Route 495. Additionally, 39 percent of the commuters using Route 93 live in towns outside of Route 495. Only 16 percent of the commuters using Route 93 live inside of Route 128.

The following two alternatives were identified for this corridor:

Commuter rail to Reading Station, shuttle to 128 West area. Some of the towns in the Route 93 corridor are served by the Haverhill/Reading commuter rail line. This line has a station in Reading, conveniently located near the Route 28 (Main Street) entrance to Route 128. Commuters from Haverhill, Lawrence, and towns further north might find it convenient to take commuter rail if shuttle service were provided from the Reading station to their work sites. This alternative would offer the greatest benefit to residents of Haverhill and North Andover, who represent an insignificant number of the survey respondents.

Park-and-ride lot near the intersection of Routes 93 and 495 for carpool, vanpool, and shuttle bus staging. This would save commuters 50 miles and $6.25 ($11.00*) each day they do not drive to the office. Thus, a person carpooling with one other person from this lot would save a maximum of $750 ($1320*) per year. Travel time would be increased by the detour to the park-and-ride lot as well as transfer time.

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*Fully allocated costs (see page 42, footnote 1).

Figure 4-8
Destinations of Survey Respondents Entering Route 128 at the Massachusetts Turnpike: Relative Volumes

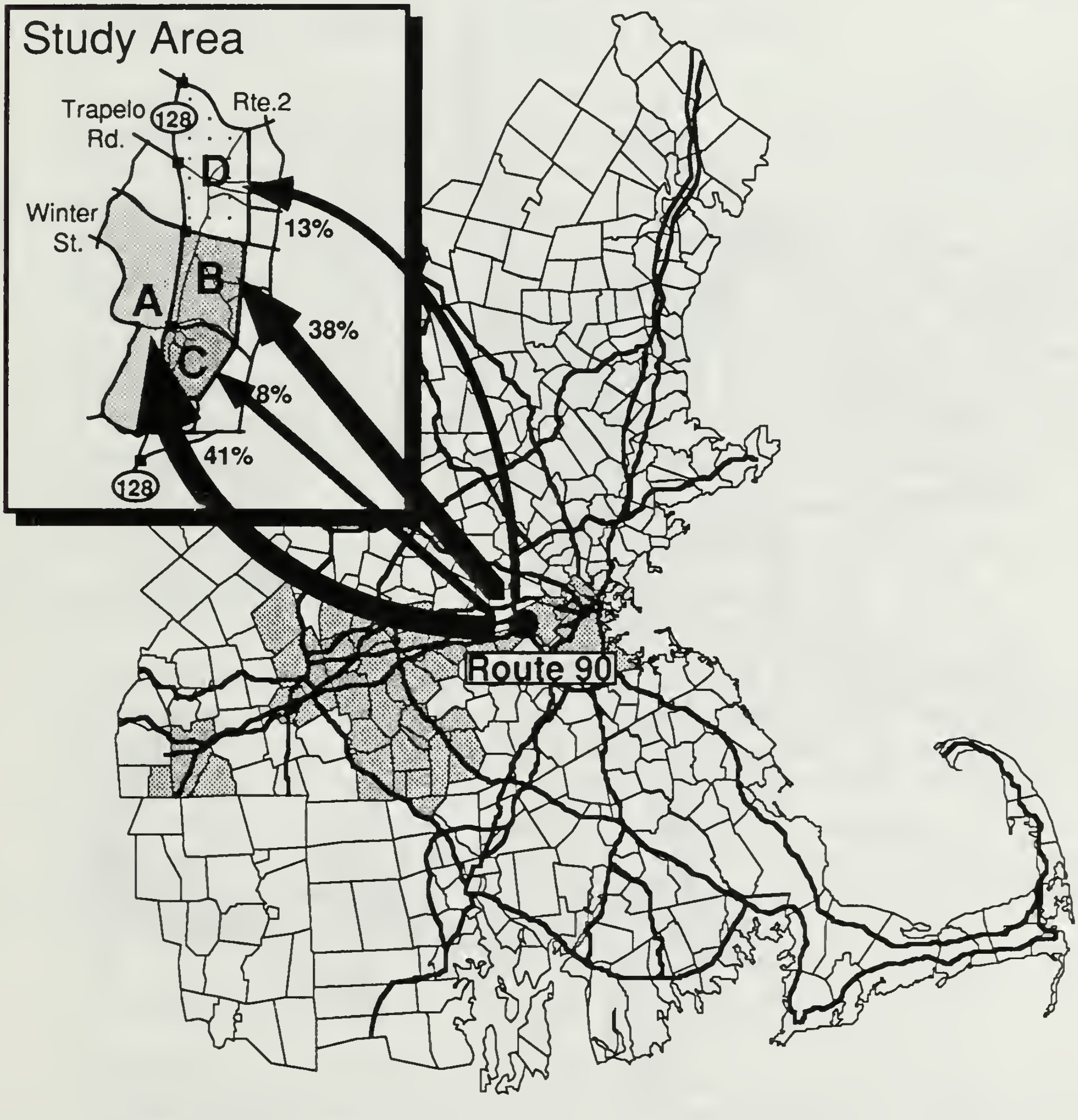
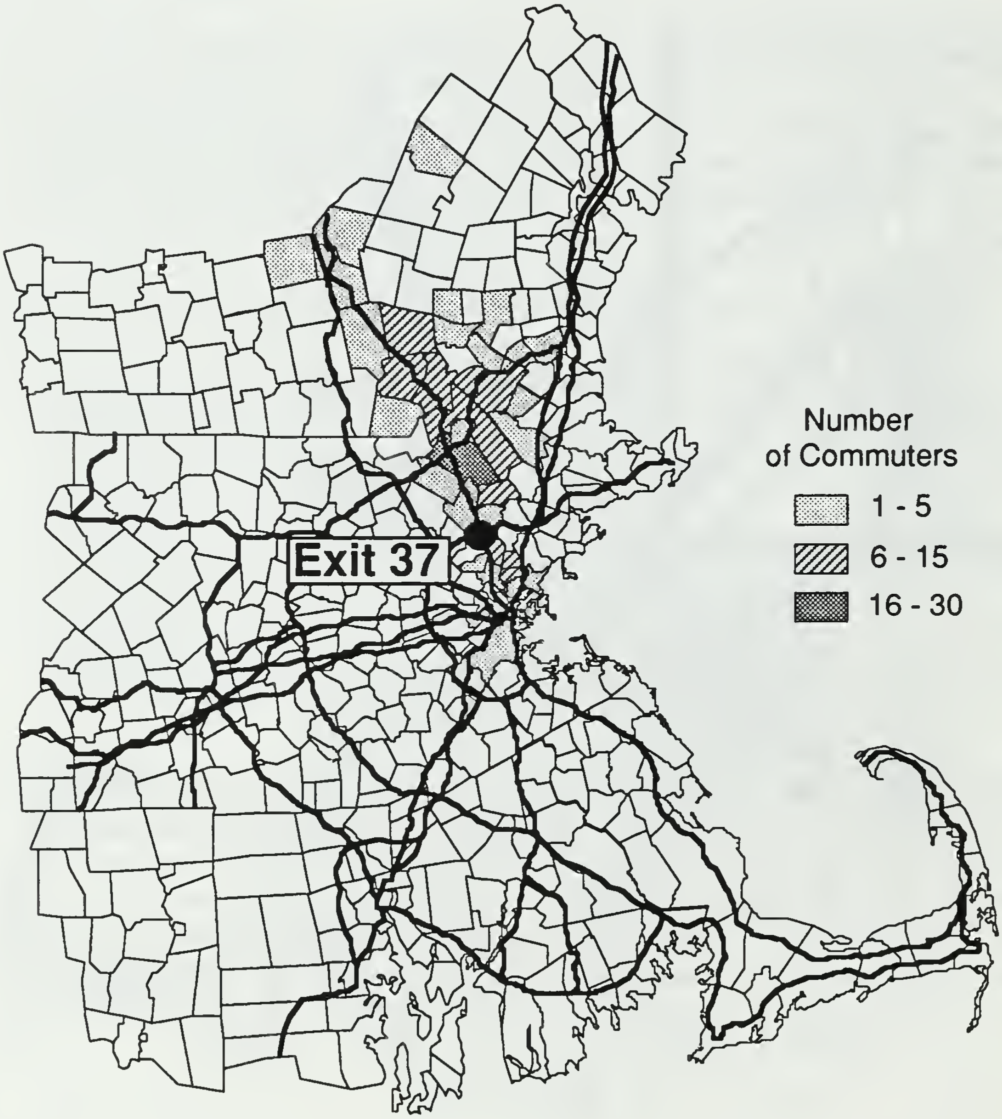


Figure 4-9
Hometowns of Commuters Entering Route 128 at Route 93



Both alternatives for 128 West commuters living in the Route 93 corridor increase travel times and offer little cost savings over the drive-alone mode. However, the park-and-ride alternative saves commuters 50 miles of driving each day they ride in a carpool, and therefore offers some cost savings.

Utilization of commute alternatives in the Route 93 corridor would have the most significant impact on the segment of Route 128 north of Route 2, but would also offer reductions on the segment between Routes 2 and 20. The impact of this reduction would decrease going southbound on Route 128 as commuters exit to their workplaces. Figure 4-10 shows the potential locations (on local 128 West roadways) of traffic reductions resulting from utilization of commute alternatives.

The most significant proportions of commuters using Route 93 are destined for Sectors B (the area to the east of Route 128 between Totten Pond Road and Trapelo Road) and D (the area to the east of Route 128 between Trapelo Road and Route 2), with 32 percent each. Sector A (the area west of Route 128 and Polaroid) follows close behind, with 29 percent. The smallest proportion (8 percent) is destined for Sector C (the area to the east of Route 128 between Main Street and Trapelo Road, excluding Polaroid). Figure 4-11 shows the relative numbers of commuters destined for each of the sectors. It is interesting to note that most of the 128 West commuters from the Route 93 corridor work at companies located on the northern end of the 128 West area (above Winter Street).

Route 95 Corridor

Route 95 enters Route 128 in Canton, south of which it serves the same corridor as Route 1. Route 95 is the more popular choice in the corridor, however, because it is a limited access roadway with faster travel times. Most (53 percent) of the commuters using Route 95 to enter Route 128 live outside of Route 495. Almost all of the remaining commuters choosing this route live between Routes 128 and 495, with only 1 percent living inside Route 128. Figure 4-12 shows the hometowns of survey respondents who use Route 95 to enter Route 128.

Two alternatives were identified for this corridor:

Commuter rail to Route 128 Station, shuttle to 128 West area. Parts of this corridor are served by the Attleboro/Stoughton commuter rail line, which has a station at Route 128, near the University Avenue exit. This line also has two branches, one providing service to Stoughton and the other providing service to Attleboro and

Figure 4-10
Route Segments Used by Survey Respondents Entering Route 128 at Route 93

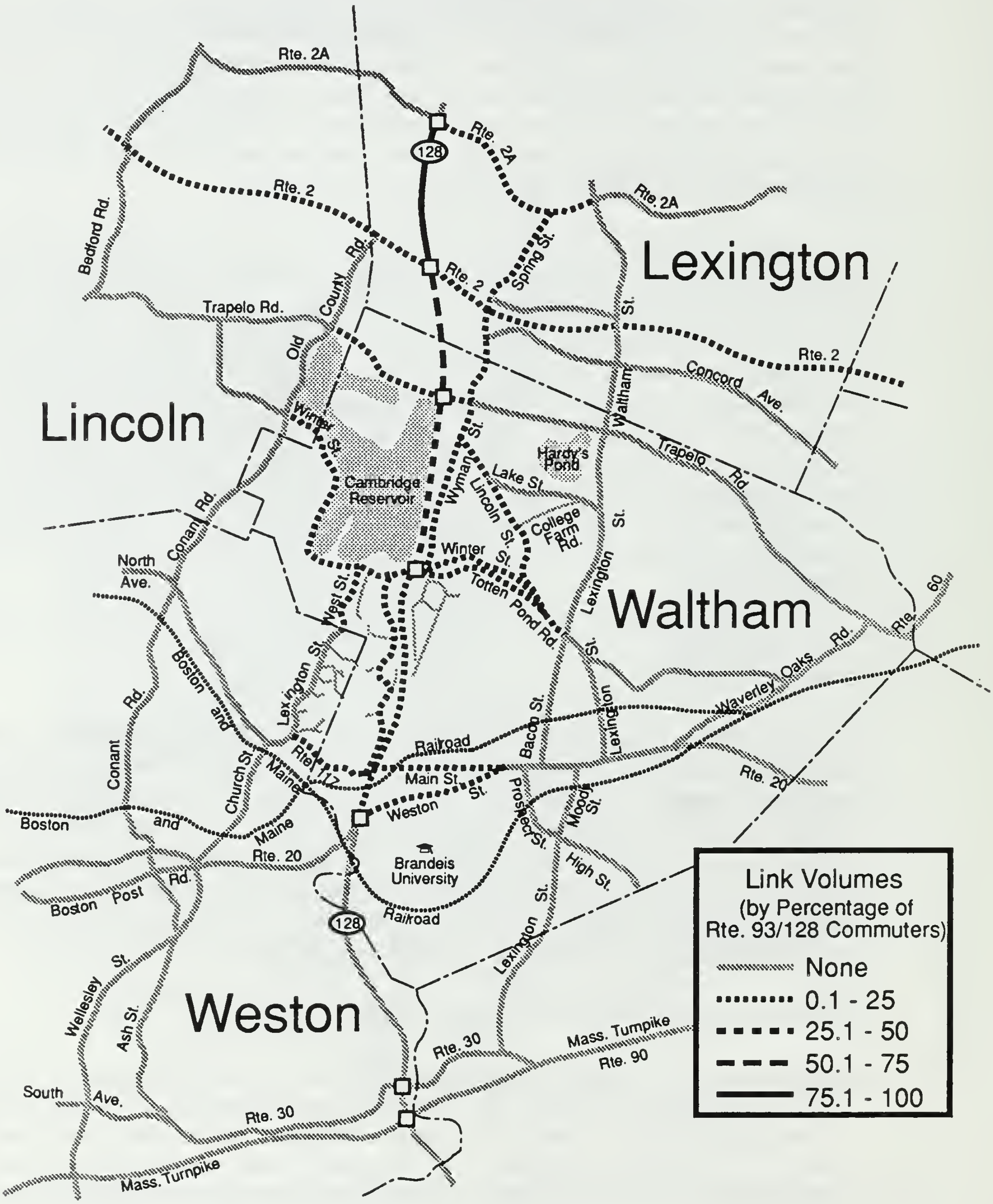


Figure 4-11
Destinations of Survey Respondents Entering Route 128 at Route 93: Relative Volumes

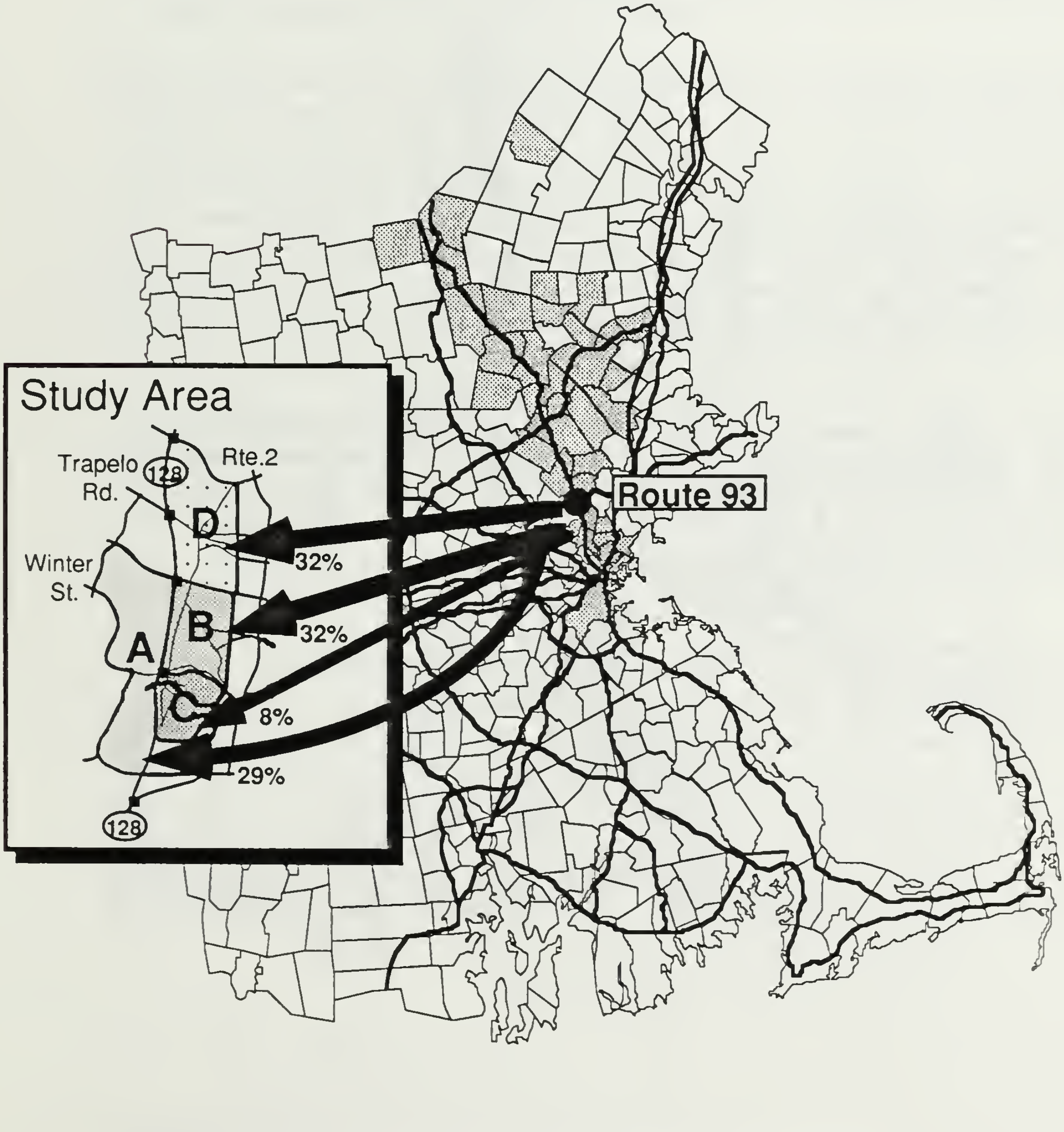
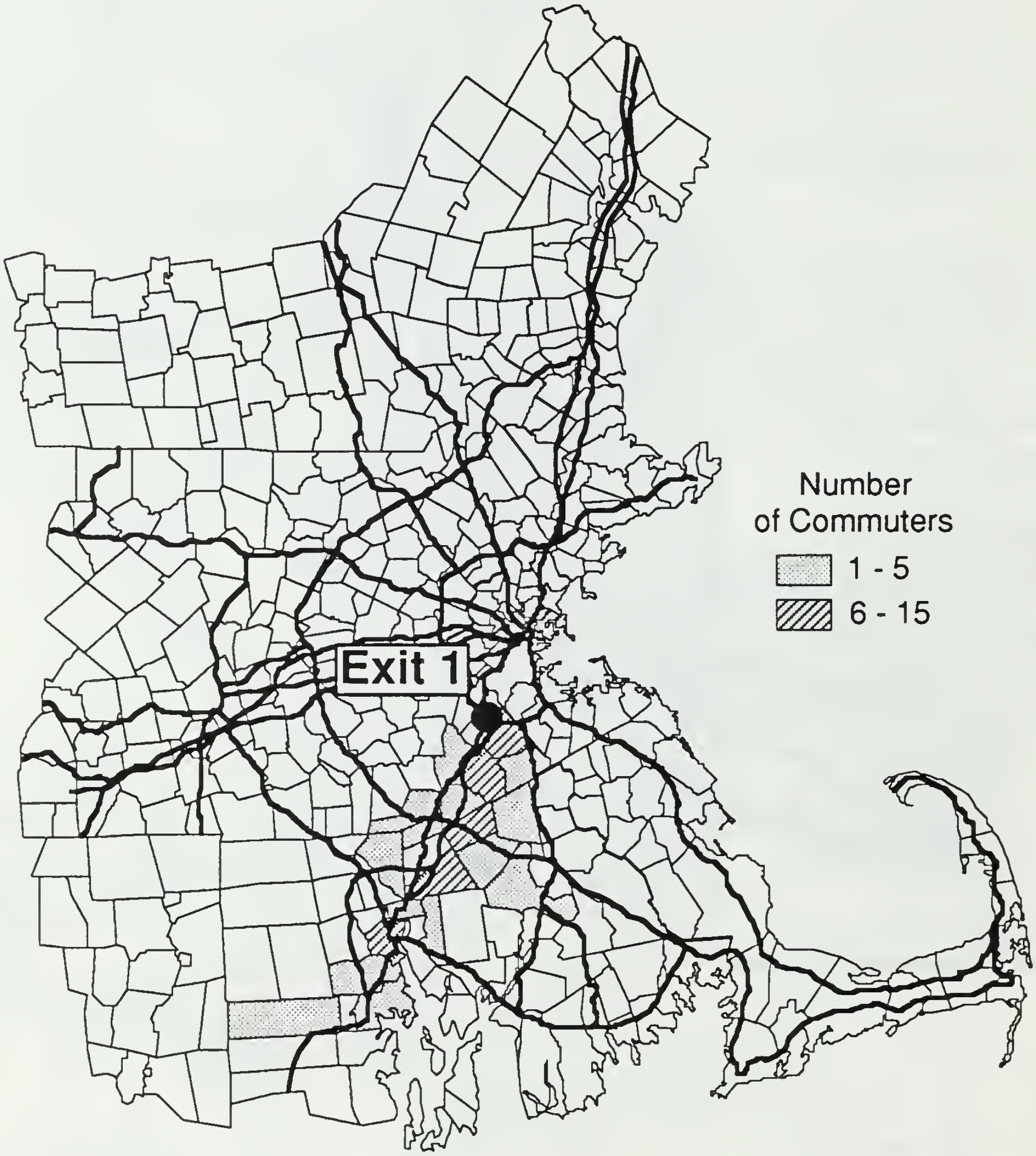


Figure 4-12
Hometowns of Commuters Entering Route 128 at Route 95



Providence, Rhode Island. Commuters from Mansfield, Attleboro, and towns further south might be interested in using this commuter rail line for their work trips if a shuttle service was provided between the Route 128 station and the 128 West employment center. The total number of respondents from these towns was only 1.2 percent of the survey respondents, and the potential use of such a shuttle would be very low.

Park-and-ride lot near the intersection of Routes 128 and 95 for carpool, vanpool, and shuttle bus staging. This would save commuters 34 miles and $4.25 ($7.48*) each day they do not drive to the office. Thus, a person carpooling with one other person from this lot would only save a maximum of $510 ($898*) per year.

While the commuter rail/shuttle option offers in-vehicle travel time savings to some of the Route 95 corridor commuters, the number of potential users of the service is too small to justify a shuttle service. The park-and-ride option would increase travel time slightly and reduce travel costs slightly. While neither option would be expected to entice a large number of commuters, the park-and-ride option would have the potential to attract a greater number if offered in combination with incentives. The park-and-ride lot at the intersection of Route 95 and 128 could also attract commuters from the South Shore.

Utilization of commute alternatives by these commuters would reduce traffic on the southern portion of Route 128, below Winter Street. Additional traffic reductions would be realized on the remainder of Route 128 in the study area (up to Route 2) and on the local 128 West roads. Figure 4-13 shows the existing use of 128 West area roads by commuters from the Route 95 corridor.

The most significant proportion (35 percent) of commuters using Route 95 are destined for Sector A (the area west of Route 128 and Polaroid). Sectors D (the area to the east of Route 128 between Trapelo Road and Route 2) and B (the area to the east of Route 128 between Totten Pond Road and Trapelo Road) follow close behind, with 30 and 28 percent, respectively. Finally, the smallest proportion (8 percent) is destined for Sector C (the area to the east of Route 128 between Main Street and Trapelo Road, excluding Polaroid). Figure 4-14 shows the relative numbers of Route 95 corridor commuters destined for each sector of the 128 West area.

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*Fully allocated costs (see page 42, footnote 1).

The analyses of the commute alternatives for the four most populated (in terms of 128 West commuters) corridors shows that all alternatives increase travel time, restrict flexibility, and offer only modest cost savings. All of the alternatives also require a deviation from the direct drive-alone route to work. If commuting conditions remain the same and no incentives are provided to use commute alternatives, few of the existing 128 West commuters would be expected to use alternative modes. However, if congestion continues to get worse and travel times become even longer or the cost of driving alone becomes greater (due to parking charges or other automobile user charges), commuters may prefer some of the alternatives discussed above.

Figure 4-13
Route Segments Used by Survey Respondents Entering Route 128 at Route 95

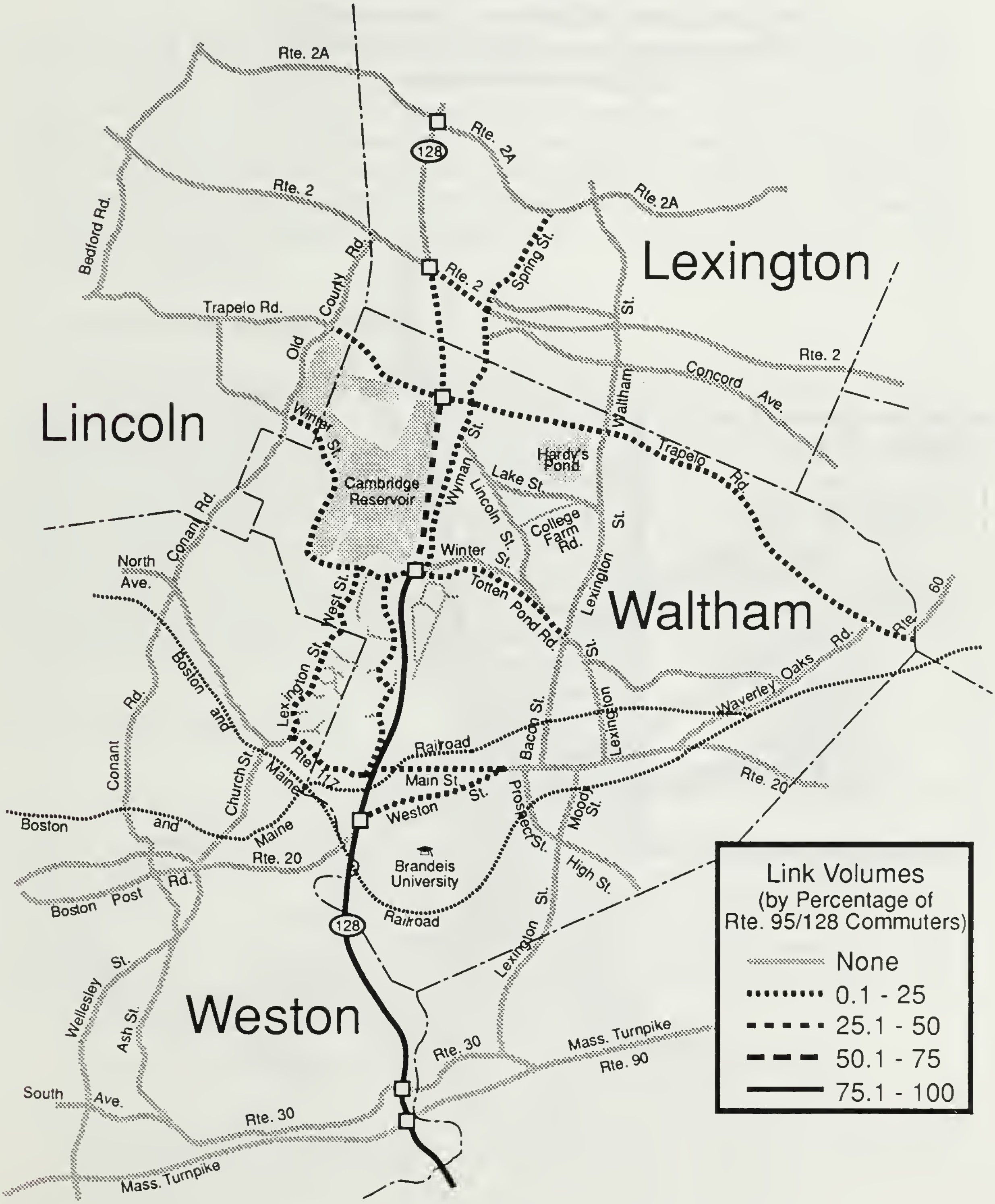
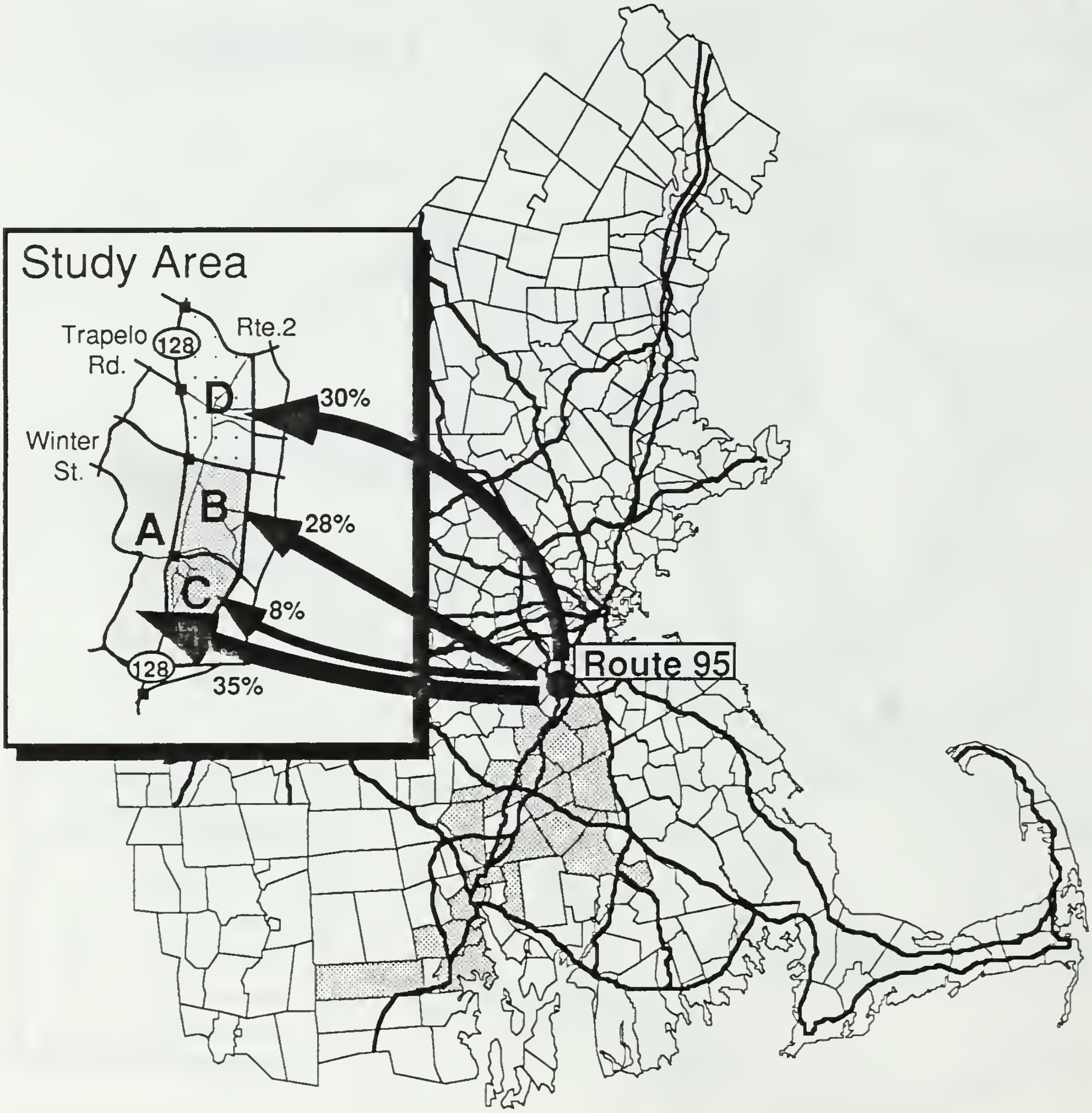


Figure 4-14
Destinations of Survey Respondents Entering Route 128 at Route 95: Relative Volumes



5 Conclusions

The most promising new 128 West commute alternatives are remote park-and-ride lots and express bus/shuttle service from downtown Boston via Riverside. In general, however, commute alternatives will attract a limited number of commuters from the drive-alone mode, given current conditions. None of the alternatives identified offer travel time savings over the drive-alone mode, and little if any cost savings are offered. At most, the alternatives are likely to attract commuters who are looking to reduce the amount of driving required to get to and from work and those who are very concerned about cost.

5.1 Assessment of Alternatives

The remote park-and-ride lot staging area option is the most likely to draw existing drive-alone commuters, because it represents little added commute time, offers the most significant cost savings of the alternatives, and has the largest commuter-shed. While the Route 300 express bus can provide travel times comparable to those of the drive-alone mode, few commuters live close enough to the Kneeland Street stop to achieve comparable travel times, and the number of commuters using Route 300 may not warrant shuttle service. However, because the shuttle would operate from Riverside Station, it would carry Green Line commuters as well. The feasibility of each of the alternatives is reviewed below.

5.1.1 Remote Park-and-Ride

Considering that relatively few commuters would be expected to use any of the commute alternatives unless conditions change, the low cost of remote park-and-ride lots is an important advantage. This approach is the most conservative and, therefore, perhaps the most appropriate, given existing conditions encouraging the single-occupant-vehicle commute mode. These lots could also be used by commuters with other destinations in the metropolitan area, and therefore could encompass a much larger market than that defined by the 128 West Transportation Council.

- Existing, underutilized lots would be used at low or no cost.

- Initial implementation can be limited to carpooling and vanpooling staging areas, and employers can work with the Transportation Council and CARAVAN (free of charge) to set up rideshare matches.

- If demand is high enough, shuttle service could later be implemented. The initial operation of carpools and vanpools would provide the required data about potential demand for shuttle services.

Travel time data indicate that potential areas for lots include the intersections of Route 495 with Routes 3, 2, 20, 93, and 95, and the Massachusetts Turnpike. While the Route 93 and Route 95 corridors offer the greatest cost savings to commuters, the Route 3 corridor offers the largest concentration of commuters. Additionally, the Route 3 corridor has the largest number of commuters living outside of Route 495, and travel times for Route 3 commuters are long, due to congestion. Finally, Route 3 offers two existing parking lots as potential remote park-and-ride lots. For these reasons, the Route 3 corridor would be expected to have the greatest success in park-and-ride utilization.

5.1.2 Express Bus/Shuttle

The Route 300 express bus route to Riverside provides an attractive alternative to commuters who live within easy access of the Kneeland Street stop. A shuttle operation serving both these riders and Green Line riders could be effective. This shuttle would serve a different market from the Alewife shuttle and provide faster service from many parts of Boston.

5.1.3 Rapid Transit/Shuttle

Rapid transit/shuttle options are most likely to be used by commuters whose transit access time is equal to their auto access time or those living closer to the 128 West area than Park Street. Alewife Station has the greatest potential of all rapid transit stations, due to its easy access to Route 2 and Route 128 and the faster travel times offered due to an exclusive right-of-way. A shuttle bus from this station could best serve employees of companies located along Route 2, but additional shuttles could be run to the remaining sectors of the 128 West area. The existing shuttle could continue to serve the Route 2 companies, and this service could be supplemented by additional shuttles.

5.1.4 Commuter Rail/Shuttle

The commuter rail/shuttle option is the least feasible:

- Few commuters live within walking distance of commuter rail stations, and two transfers (from auto to rail and rail to bus) are required for all others.

- The number of commuters for whom rail is convenient is not high enough for efficient operation of shuttles.

- Parking is limited at commuter rail stations.
- Only the Kendall Green and Waltham Center stations are located near the 128 West area.

Waltham Center is more feasible than Kendall Green as a shuttle location. A shuttle from Waltham Center would serve not only Fitchburg/Gardner Line commuter rail users, but also local bus riders from Waltham, Watertown, and Waverly, and residents of Waltham who have access to this location.

5.2 Implementation

The implementation of commute alternatives for 128 West commuters must be a cooperative effort of 128 West employers, the 128 West Transportation Council, CARAVAN, and the Massachusetts Department of Public Works (DPW). The 128 West Transportation Council should work to initiate implementation of the most promising strategies. The remote park-and-ride alternative should be given priority, because it is low cost and provides opportunities for all metropolitan area commuters. To implement this alternative, the Council should work with the DPW to establish relationships with private parking lot owners, and work with CARAVAN to disseminate information about rideshare opportunities and establish potential commuter matches.

Initially, remote park-and-ride lots would be established for the purpose of commuters' meeting to form carpools and vanpools. The 128 West Transportation Council could then monitor the use of these lots and gather information about the users to determine if demand warrants shuttle bus service.

The Riverside shuttle bus alternative offers the second highest potential for attracting drive-alone commuters. It could attract both Green Line commuters and Route 300 express bus riders. The 128 West Transportation Council could sponsor a shuttle between Riverside and the 128 West employment center, similar to the existing Alewife shuttle. The shuttle would be coordinated with the Route 300 schedule, in order to minimize wait time for transferring passengers.

In order to obtain a significant reduction in single-occupant vehicles, the 128 West Transportation Council should encourage the establishment of programs that provide incentives to employees to use alternative modes. These incentives can include the following:

- Subsidization of rideshare programs, in the form of vanpool or shuttle bus subsidies

- Providing every employee with a list of potential ridesharers based on the employee's origin, destination, and schedule

- Making company cars or a company shuttle available for daytime errands

The potential success of commute alternatives in reducing congestion is limited by the number of commuters who choose to switch from single-occupant vehicles to higher occupancy modes. If very few commuters switch to alternative modes, no reduction in congestion will occur. Few commuters will switch, however, unless the alternative provides some advantage over the existing mode choice. Therefore, employers in the 128 West area will have to offer some incentive to their employees to use commute alternatives, in order to impact congestion.

Regardless of whether any new commuting alternatives are implemented, the 128 West Transportation Council should continue working with CARAVAN to:

- promote carpooling and vanpooling as alternatives to driving alone and disseminate information to 128 West commuters about the benefits of these alternatives,

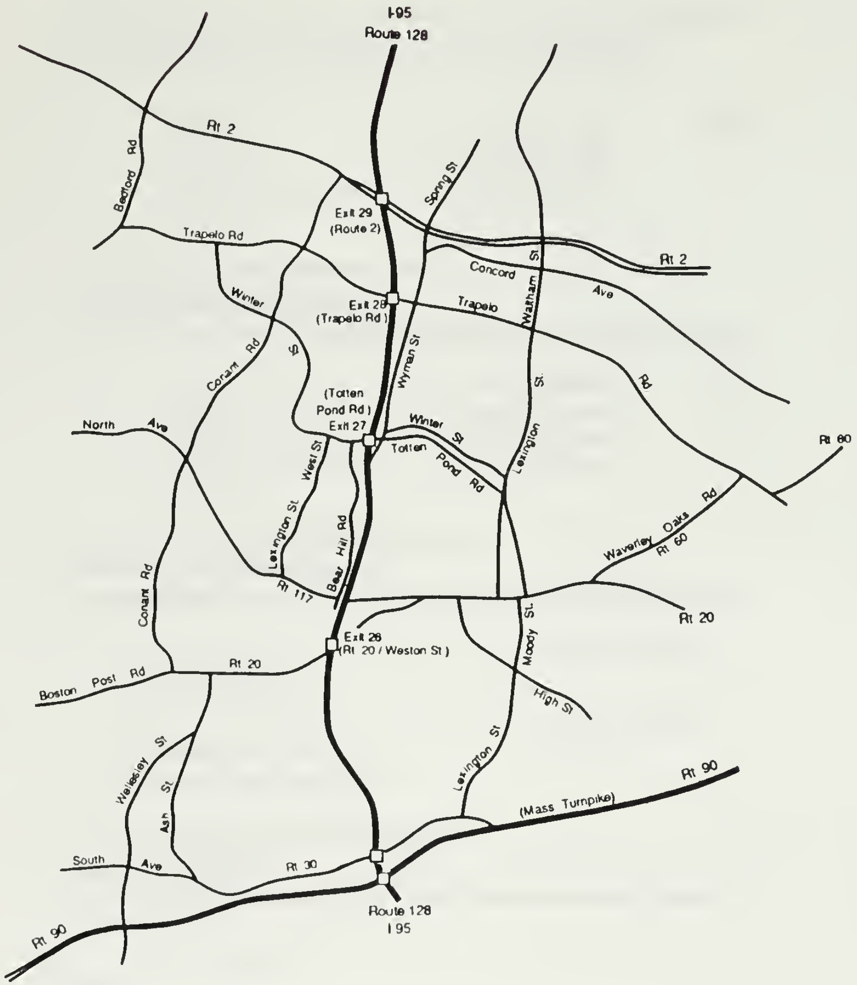
- provide matching services for commuters who are interested in carpooling or vanpooling, and

- encourage employers to provide incentives to employees to choose high-occupancy commute alternatives over the single-occupant vehicle.

Appendix A

128 West Employee Questionnaire

21. Below is a map of the Waltham Route 128 Corridor. Please draw your typical route to work in this area.



IF YOU WOULD LIKE INFORMATION ABOUT CARPOOLING OR VANPOOLING, PLEASE FILL IN YOUR NAME AND WORK TELEPHONE NUMBER

____

____

OR CALL THE WALTHAM 128 TRANSPORTATION

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1 08736

128

WALTHAM 128 TRANSPORTATION COUNCIL

EMPLOYEE SURVEY

Please assist us with improving the commuting in the 128 area by answering the following questions. Your responses are anonymous and will be used for transportation planning purposes only. Thank you for your cooperation.

1. Where do you live?

City/Town 6 |_|_|_|_|_|_|_|_|_|_|_|_|_|
State 18 |_|_|
Zip Code 20 |_|_|_|_|_|
Street Address 25 |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

2. What time do you usually arrive at work?

40 |_|_|:|_|_| 44-1 ___ a.m.
-2 ___ p.m.

3. What time do you usually leave work?

45 |_|_|:|_|_| 49-1 ___ a.m.
-2 ___ p.m.

4. Which of the following best describes how your schedule works?(Check One)

50-1 ___ I must arrive and depart at specific times set by my company.
-2 ___ I choose my own start and end times which are approved by my company.
-3 ___ I can vary my start and end time without prior approvals.

5. How much flexibility do you have in choosing the time you start work on a day-to-day basis?

51-1 ___ None
-2 ___ Up to 15 minutes
-3 ___ 16-30 minutes
-4 ___ 31-60 minutes
-5 ___ Up to 2 hours
-6 ___ More than 2 hours

6. Please indicate how you most frequently get to work.

52 01 ___ Drive alone
-02 ___ Drive carpool
03 ___ Drive vanpool
-04 ___ Vanpool passenger
-05 ___ Carpool passenger (Driver parks at my workplace)
-06 ___ Dropped off (Driver leaves)
-07 ___ Other: ______________________________
-08 ___ Bus
-09 ___ Train
-10 ___ Taxi
-11 ___ Motorcycle
-12 ___ Bicycle
-13 ___ Walk

54 ☐

7. If you are carpooling or vanpooling, how many passengers are in the vehicle? (not including driver)

55 |_|_| Passengers

8. How long does it usually take you to commute to work?

57 |__|__| Minutes

9. Does the time it takes you to commute to work vary from day to-day?

59 1 __ Hardly at all
-2 __ Occasionally
-3 __ Frequently

10. If your commute to work varies, by how much does it usually vary?

60 |__|__| Minutes

11. If you usually use Route 128 for your commute to work, which portion do you use?

62 1 __ I do not usually use Route 128.

-2 __ I usually use Route 128:
I usually enter from:
63 |__|__|__|__|__|__|__|__|__|__|__|__|__| (Name of Street)
I usually exit at:
76 |__|__|__|__|__|__|__|__|__|__|__|__|__| (Name of Street)

12. How frequently do you drive a car during work hours (including lunch) during a typical week?

89 1 __ Do not drive car during work hours.

Drive car for:
-2 __ Company business 90 |__| days per week
-3 __ Meals 91 |__| days per week
-4 __ Personal business 92 |__| days per week
-5 __ Other:______________ 93 |__| days per week 94 ☐

13. How frequently do you make any stops as you travel home from work during a typical week?

95 1 __ Do not make stops after work.

Make stops:
-2 __ Pick up someone 96 |__| days per week
-3 __ School 97 |__| days per week
-4 __ Errands 98 |__| days per week
-5 __ Other:______________ 99 |__| days per week 100 ☐

14. If your car were not available for your trip to work, and transportation to your worksite were to be provided from a central location, which location(s) would be most convenient for you?

101-1 __ Riverside Station (Green Line)
102-1 __ Alewife Station (Red Line)
103-1 __ Waltham Center (Commuter Rail, Local and Express Bus)
104-1 __ Weston (Commuter Rail)
105-1 __ Other location:______________________ 106 ☐☐
108 1 __ No central location

15. How many automobiles are owned by you and members of your household?

109 |__| Automobiles

16. How frequently do you typically travel from your office to Logan Airport?

110 |__|__|__| Times per year

17. If you ever use other modes of transportation to get to work, please indicate which one you are most likely to use. (If you do not, go to question 19.)

113 01 __ Drive alone -08 __ Bus -11 __ Motorcycle
-02 __ Drive carpool -09 __ Train -12 __ Bicycle
-03 __ Drive vanpool -10 __ Taxi -13 __ Walk
-04 __ Vanpool passenger
-05 __ Carpool passenger (Driver parks at my workplace)
-06 __ Dropped off (Driver leaves)
-07 __ Other:______________________________ 115 ☐

18. How frequently do you use the above alternative mode of transportation to get to work?

116 |__|__| Times per month

19. Which of the following categories best describes your position?

118-1 __ Executive/Managerial
-2 __ Professional/Technical
-3 __ Administrative/Support/Clerical
-4 __ Sales/Service
-5 __ Production/Crafts
-6 __ Maintenance/Trade
-7 __ Other:______________________________

20. Do you have any suggestions that would improve your commute to work?

|__|__| 119
|__|__| 121
|__|__| 123
Office Use

-OVER-

Appendix B

Survey Return Rate by Employer

Route 128 West
Survey Return Rate by Employer

Company Name	Address			# Employees	# Surveys	# Returned	% Returned
Collaborative Research	20	Acorn Park	Bedford	50	50	25	50.0%
Raytheon Corp.	141	Spring Street	Lexington	1,125	1,185	684	57.7%
Fay, Spofford & Thorndike	191	Spring Street	Lexington	225	225	134	59.6%
GTE Government Systems	77	A Street	Needham	500	500	192	38.4%
Inspex, Inc.	40	Bear Hill Road	Waltham	45	44	23	52.3%
TGM Detectors	160	Bear Hill Road	Waltham	30	30	?	?
Chipcom Corp.	195	Bear Hill Road	Waltham	85	85	0	0.0%
Black & Webster	219	Bear Hill Road	Waltham	50	51	30	58.8%
D. A. Zeskind & Assoc.	235	Bear Hill Road	Waltham	3	3	0	0.0%
Western Union Electric Mail	255	Bear Hill Road	Waltham	7	7	0	0.0%
Villeroy & Boch	335	Bear Hill Road	Waltham	7	7	0	0.0%
Bay State Florist Supply Co.	285	Bear Hill Road	Waltham	45	45	0	0.0%
Xerox/Diablo Corp.	135	Bear Hill Road	Waltham	7	7	0	0.0%
Mass. Broken Stone Co.	133	Boston Post Road	Waltham	15	15	0	0.0%
Computer Graphics, Inc.	22	College Farm Road	Waltham	6	6	0	0.0%
Henco Software, Inc.	100	Fifth Avenue	Waltham	60	61	29	47.5%
R. R. Donnelly & Sons Co.	100	Fifth Avenue	Waltham	20	20	0	0.0%
Artificial Intelligence Corp.	100	Fifth Avenue	Waltham	90	90	39	43.3%
Natural Intelligence	200	Fifth Avenue	Waltham	14	14	12	85.7%
PHEOP	200	Fifth Avenue	Waltham	45	45	29	64.4%
PCU Federal Credit Union	400	Fifth Avenue	Waltham	40	60	33	55.0%
Thermo Electron Corp.	101	First Avenue	Waltham	350	349	0	0.0%
Kloss Video Corp.	42	Fourth Avenue	Waltham	175	175	0	0.0%
Kronos, Inc.	62	Fourth Avenue	Waltham	125	130	44	33.8%
Jupiter Technology	78	Fourth Avenue	Waltham	44	45	38	84.4%
EG&G Publications & Media	20	Fox Road	Waltham	15	15	7	46.7%
Carlsberg Printers, Inc.	26	Fox Road	Waltham	65	65	42	64.6%
W. R. Grace	55	Hayden Street	Waltham	500	500	0	0.0%
Control Data	60	Hickory Drive	Waltham	130	130	59	45.4%
Weston Emergency Light	33A	Jones Road	Waltham	5	5	0	0.0%
IBM	610	Lincoln Street	Waltham	500	500	92	18.4%
Eartern Reproduction Corp.	1250	Main Street	Waltham	17	17	7	41.2%
Advanced Interactive Systems	1377	Main Street	Waltham	30	30	14	46.7%

Route 128 West
Survey Return Rate by Employer (cont.)

Company Name	Address			# Employees	# Surveys	# Returned	% Returned
Horizon Research	1432	Main Street	Waltham	25	25	13	52.0%
Keane Fire & Safety Equip.	1500	Main Street	Waltham	30	30	12	40.0%
Sylvania Technical School	95	Second Avenue	Waltham	50	53	23	43.4%
Teledyne Engineering Service	130	Second Avenue	Waltham	65	65	?	?
Telematics	204	Second Avenue	Waltham	13	14	0	0.0%
Automated Data Processing	225	Second Avenue	Waltham	560	500	165	33.0%
Sullivan & Cogliano Co.	230	Second Avenue	Waltham	130	131	67	51.1%
Jason M. Cortell & Assoc.	244	Second Avenue	Waltham	20	22	14	63.6%
Mass. Assoc. Realtors	256	Second Avenue	Waltham	18	18	6	33.3%
Technology Sales, Inc.	332	Second Avenue	Waltham	15	16	6	37.5%
IPL Systems, Inc.	360	Second Avenue	Waltham	40	40	0	0.0%
Honeywell Bull	200	Smith Street	Waltham	1,000	1,000	0	0.0%
GTE Laboratories	40	Sylvan Road	Waltham	700	700	332	47.4%
Perkin-Elmer	214	Third Avenue	Waltham	5	5	0	0.0%
The Management Group, Inc.	393	Totten Pond Road	Waltham	3	3	0	0.0%
McBar Associates, Inc.	460	Totten Pond Road	Waltham	6	6	0	0.0%
Bridge Communications	470	Totten Pond Road	Waltham	7	0	0	0.0%
Office Specialists	470	Totten Pond Road	Waltham	4	4	0	0.0%
The College Board NE Region	470	Totten Pond Road	Waltham	10	10	9	90.0%
Unisys Corp.	1601	Trapelo Road	Waltham	25	24	0	0.0%
National Medical Care	1601	Trapelo Road	Waltham	230	230	138	60.0%
Computer Forum	1601	Trapelo Road Bldg C	Waltham	8	8	8	100.0%
Atena Life Ins. & Annuity Co.	1601	Trapelo Road Bldg C	Waltham	15	16	0	0.0%
CEPCO Corp.	181	West Street	Waltham	4	5	5	100.0%
Unicorn Group	195	West Street	Waltham	7	7	0	0.0%
Little, Brown & Co. Pub.	200	West Street	Waltham	200	200	61	30.5%
Egghead Software	245	Winter Street	Waltham	12	13	0	0.0%
Corporate Tech Planning, Inc.	245	Winter Street	Waltham	5	5	5	100.0%
Somerville Lumber	281	Winter Street	Waltham	110	110	8	7.3%
SmithKline Laboratories	343	Winter Street	Waltham	300	300	109	36.3%
Business Systems Resources		Winter Street	Waltham	15	15	6	40.0%
Baybank Middlesex	425	Winter Street	Waltham	9	9	3	33.3%
Polaroid Corp.	868	Winter Street	Waltham	5,000	4,500	1,141	25.4%

Route 128 West
Survey Return Rate by Employer (cont.)

Company Name	Address		# Employees	# Surveys	# Returned	% Returned
Calay Systems, Inc.	950 Winter Street	Waltham	2	2	0	0.0%
Advantage Systems, Inc.	950 Winter Street	Waltham	50	50	28	56.0%
Unibase Systems, Inc.	303 Winter Street	Waltham	4	4	0	0.0%
Hewlett Packard	175 Wyman Street	Waltham	1,200	1,200	324	27.0%
Arkwright Boston	225 Wyman Street	Waltham	470	469	243	51.8%
Digital Corp.	235 Wyman Street	Waltham	350	350	114	32.6%
Dennison Manufacturing Corp.	275 Wyman Street	Waltham	65	65	43	66.2%